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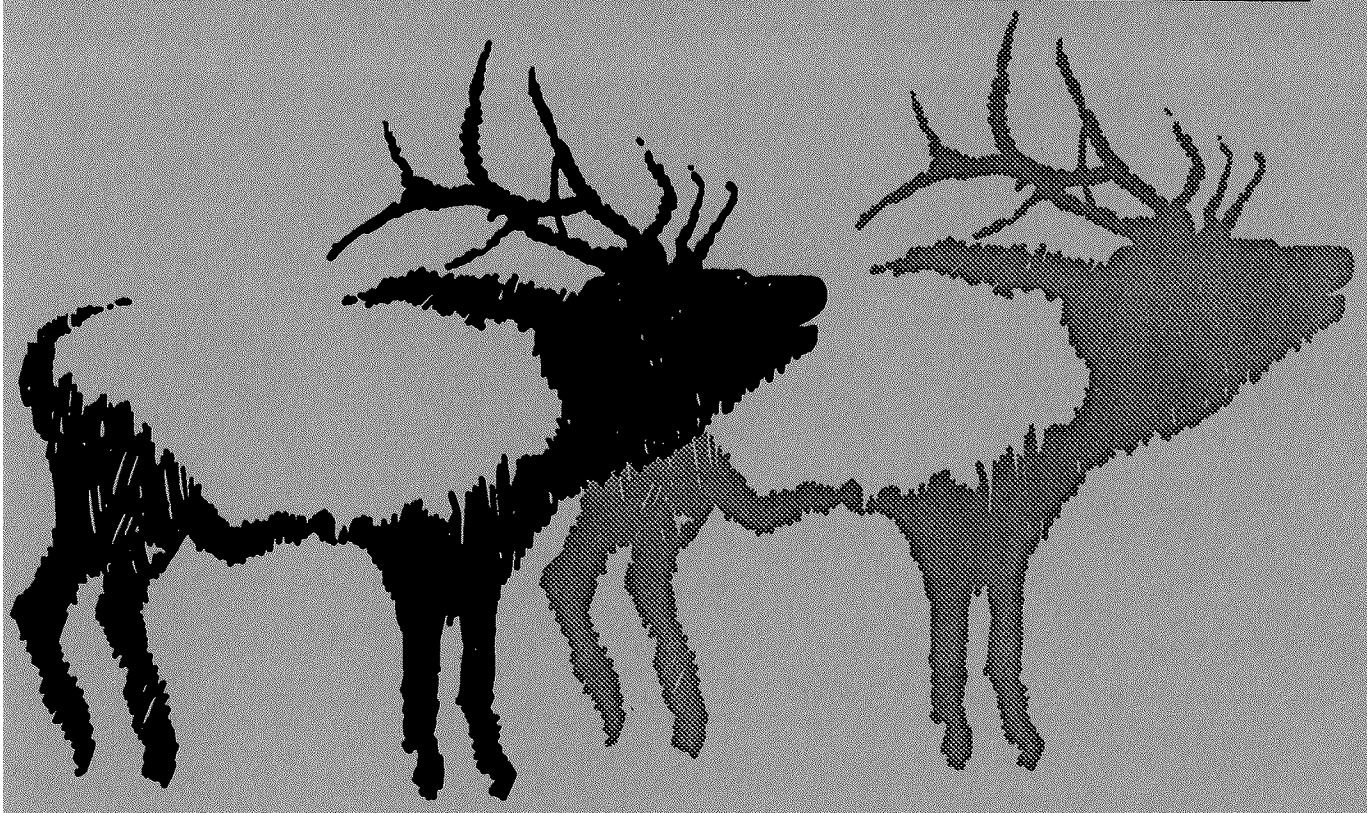
Wilderness Areas: *Their Impact*



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Edited by
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FOREWORD

WILDERNESS AREAS: THEIR IMPACTS

Wilderness has created very polarized views. Often we only present the information that supports our view. But to understand the polarization surrounding wilderness we must have accurate facts and understand each others viewpoint. With accurate information and by listening to each other we can start reducing the polarization on wilderness and begin resolving the problems associated with wilderness.

This wilderness symposium has brought together experts with different perceptions on the purpose, management, need and goals we, as a society, have for wilderness areas. The keynote session addresses why wilderness areas were initially designated and what the future may be for these areas as well as those that could be designated as wilderness. The second session on biodiversity, focuses on how wilderness areas and their management affects biodiversity. Ideas are presented on possible management changes and what their impacts could be. The session on society's use of wilderness areas looks at how these areas and those that may be designated are used and how different uses are altered. The problems associated with actually managing wilderness are addressed by the Forest Service and National Park Service. They discuss how wilderness area management decisions are made by their respective organizations. The concluding paper looks at the implications of proposed management changes and what they mean to society.

The purpose of this symposium is to bring together the different ideas on wilderness areas and their impacts so they may be discussed to help those impacted, positively as well as negatively, understand why and how others view wilderness. With this information it is hoped that the conflicts surrounding wilderness can begin to be resolved.

Allen Rasmussen
Symposium Chairman

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Wilderness Areas: Their Impacts

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PROTECTING AMERICA'S PRECIOUS PLACES

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ABSTRACT: America's 90 million acre National Wilderness Preservation System requires an active management program to protect the values it protects. This paper suggests that several issues confront the process of developing an adequate and appropriate management program: (1) lack of understanding of the meaning of wilderness; (2) lack of knowledge of natural processes and wilderness clientele; (3) inadequate education and training of wilderness managers; (4) poor understanding of the social and economic consequences of maintaining natural processes; and too often viewing wilderness as a primitive recreation area. Four principles for developing management actions are identified: (1) maintenance of ecological processes and natural conditions should govern management; (2) wilderness dependent human uses should be emphasized; (3) involve the public in wilderness management planning; and (4) avoid actions that intrude into experiences.

Spring is a time of turbulence and the season's winds bring with them the metamorphosis to new life and the promise of futures still to be borne. Spring freshets are bold, enthusiastic, almost careless in their spirited tumble from snowy watersheds, yet alerting the sympathetic observer to the bright expectations of the coming months.

Like spring freshets and breezes, a global tempest in ideas is jolting us out of our settled and comfortable way of viewing the future. There is chaos, rather than tranquility, in our world. This is good because the upheaval in thinking bears fresh and energetic visions of what our world should become, of what is just and what is right. At no other time in the recent past have so many people in so many places peacefully revolted against the dominant paradigm of governing and economic systems. The awakening of peoples to their intrinsic rights as human beings encompasses more than how to govern, and like spring clouds upwelling on thermal drafts, will grow to encircle other questions and places as well.

Concerns about democracy, self-determination, environmental quality, ancient forests, and global warming shape the context of America's growing debate over the management of its most precious places. These precious places comprise our National Wilderness Preservation System, a system of about 500 units and over 90 million acres. Found in nearly every state, designated wilderness is truly a resource of priceless value, and forms an extraordinary yet essential bequest to our grandchildren. John Muir once noted that "wilderness is a necessity; and that mountain parks and reservations are useful not only as fountains of timber and irrigating rivers, but as fountains of life." The fountain of life is our precious legacy; how we defend and protect it now determines what our grandchildren will receive later.

Wilderness is precious because the solitude and serenity found there are all too often isolated remnants of what life should be all about. Wilderness is precious because of the lessons it provides about natural ecosystems; lessons about diversity, change, relationships, process.

Wilderness is precious because it is sensitive to human-induced impacts, impacts which once they occur not only alter what we have protected, but become difficult to rectify. Wilderness is precious because it symbolizes not only what we value as a society but also because of the role it has played in our heritage.

Like the enthusiasm of a spring breeze displacing the staleness of a winter inversion, the blustery winds of global social change affect wilderness. I have previously spoken of the need to understand change and its implications for wilderness and wilderness management before: "The view of wilderness as a static (and beautiful) landscape is giving way to the notion that it is a dynamic (and sometimes ugly) place that is valued because freely operating ecological processes generate landscapes that are natural, shifting, complex and, to some extent, unpredictable" (McCool 1989). In wilderness, beauty is defined by process, not by outcome, and natural ecological changes will come to be understood, appreciated and valued. I have also noted how the definitions of parks and wildernesses are deeply embedded within our social values, and how, when those values change, conflict develops over the management of these resources (McCool 1983). Just as a summer thunderstorm breeds atmospheric drafts of incredible energy, social change leads to extraordinary struggles over management of our precious places.

Change forces us to deal with protecting the wild integrity of wilderness as an urgent responsibility. While we still argue over what additional pristine areas should be allocated to wilderness, management is arguably the most important issue confronting the system. Like the noble Bald Eagle or the magnificent Grizzly Bear, our Wilderness System is threatened, and the values it protects may be irreversibly lost in the next decade, thereby nullifying this gift to our heirs.

We know that our wilderness system is threatened. It is threatened by atmospheric deposition from unwanted pollutants. It is threatened by boundaries that allow individual wildernesses to be designated without a full understanding of ecosystem processes. It is threatened by too many compromises in the legislative process that allow incompatible uses to continue and which provide little direction on how we should manage them. It is threatened by a serious shortage of professionally educated wilderness managers. It is threatened by an all too often species versus ecosystem management approach. And, in some places, wilderness values are threatened by the unacceptable impacts from recreational use. Simply put, our approach to protecting the wild integrity of these precious places is typified by too few resources in terms of appropriately trained staff, not enough money to monitor wilderness conditions, very little understanding of the historical and philosophical foundations of wilderness, and insufficient knowledge about the ecological complexities, nuances and consequences of natural systems. And like the endangered populations of the Bald Eagle, the Grizzly Bear or the Timber Wolf, neglect, even though benign, does not repair the damage wrought by unknowing actions.

What I would like to do today is to first briefly explore with you the major issues confronting the protection and management of America's precious places. Second, I propose basic principles of management that are prerequisites to bringing these precious places back from the brink of endangerment. My emphasis in this presentation is not so much on specific threats, but on how we must design our management to control them.

Management is required to protect or restore the wild integrity of these precious places. We cannot afford to put a line around them and leave them alone. The values are too important, too scarce, too irreversible and too endangered to manage by neglect. Our ordinary custodial, reactive and crisis-management styles of decision-making are no longer acceptable because of the various threats confronting the wilderness system. Management is more than

trail maintenance and litter pickup, it is an active, yet sensitive and systematic set of actions designed to resolve issues, reclaim sites, allow natural processes to operate, and permit visitors to enjoy the significant personal and social benefits of wilderness. Management involves establishing goals, monitoring change and impacts, setting standards of acceptable human-induced changes, rehabilitating sites, educating visitors, and, in a few places, more intrusive actions. Many battles have been fought over what lands should receive designation as wilderness. However, without management the values for which many have fought can be lost.

ISSUES IN IMPROVING THE QUALITY OF WILDERNESS MANAGEMENT

1. Lack of Understanding of the Meaning of Wilderness.

A specific philosophical tradition, rooted in the romanticist writings and transcendental philosophy of the 19th century guides the management of our precious places. Thoreau's famous statement "...In wildness is the preservation of the world" was a reaction to the human excesses of an industrial revolution that had little recognition of the values of wild things. George Catlin's call in 1833 for a nation's park where the Indian and buffalo would continue in "their pristine beauty and wildness" acknowledged the importance of maintaining primeval human-nature relationships in pristine settings. In some respects, this was an early cry for ecosystem management. John Muir, Bob Marshall, Joseph Wood Krutch, Sigurd Olson, Aldo Leopold and others built upon and strengthened this tradition of wildness as an integral component of American life.

At the National Wilderness Management Conference in Minneapolis in September 1989, U.S. Representative Bruce Vento called for a "revolution in wilderness management" needed to protect the integrity of wild places (Vento 1990). This revolution can succeed if, and only if, our managers are deeply steeped in the philosophical, cultural, and historical heritage that is wilderness.

2. Poor Knowledge About Natural Processes and Wilderness Clientele.

One of the fascinating aspects of wilderness is that it protects the bustling energy of nature's complex and dynamic ecosystems. Indeed, a principal reason for wilderness is to preserve a few places in our increasingly developed planet where ecosystems can function without the unwanted interference of human occupation. We are only now beginning to identify, yet understand, the elaborate and still mysterious interactions among the flora, fauna and ecological processes endemic to wilderness.

We have made considerable progress in grasping the role of fire as a shaper of the vegetative mosaic. But how much do we understand about the more subtle second and third order ecological consequences of fire such as the effect on nutrient cycling and its impact on fish populations? Only recently have we identified how changes in air quality may affect the biotic environment, but we have yet to understand how other forces of nature — avalanches, earthquakes, insects, animals, meteorological events, floods— interact.

We also lack a healthy understanding of the social and psychological values of wilderness, and the implications of these values for protection and management. The scientific literature on these benefits and visitor attitudes toward wilderness environments is only now beginning to be cumulative (Driver et al. 1987; Stankey and Schreyer 1987). Nearly all wilderness research on people has been directed at recreational uses; we know little about the spiritual, educational and personal development uses and values of wilderness. And, after 25 years of wilderness management, we still have no reliable and cost effective method of estimating and reporting how many people visit wilderness. How can we possibly manage human

uses of wilderness if we lack the basic inventory information about those uses?

3. Inadequate Training and Education of Wilderness Managers.

Many of the recently designated wildernesses occur on National Forest and Bureau of Land Management districts that previously had no mission in management of protected lands. Natural resource management oriented toward extracting material goods and services and a philosophy of turning wild environments into more domesticated and controllable ones dominates these units. Protecting a naturally functioning ecosystem is a new responsibility for these managers. Yet, few are trained in understanding wilderness, and its values and philosophy.

Our professional land management schools have done little to provide the needed academic background for the wilderness management task. Most train land managers well in extracting commercial products from wildlands; few train managers in understanding amenity resources and appreciating the nondollar benefits of pristine environments or the subtleties of working with natural processes instead of replacing them. And, we have not done well in instructing our students about the realities of working in a dynamic, even chaotic, social framework where politics is a legitimate component of the decision-making process.

4. Social and Economic Consequences of Maintaining Ecological Processes are Poorly Understood.

I spoke earlier about how little we now know about natural processes in wilderness. Comparatively, our understanding of the social and economic consequences of these natural processes is meager. Yet, it is the social-political system that drives wilderness designation and management. We, as a profession of resource managers have been too timid about working with users of wilderness: we rarely contact our clients, preferring instead the appearance, if not reality, of the socially safer shelter of ranger stations and backcountry patrols. Our clients have little understanding of what wilderness management is about, and we, in turn, know little about how our clients feel about management actions.

An excellent example of not learning about the social and political consequences of natural processes are the fires of 1988, many of which were naturally occurring. The fires produced a wave of confusion in the public, as well as among natural resource managers, about the capacity of a system to absorb natural events even though we explicitly desired such to happen. We were not prepared for the social and economic consequences of these events. Nor did we design and implement the research programs to learn from these events.

5. Wilderness is Too Often Viewed as an Area for Primitive Recreation.

Wilderness is a special place, one that contains values which depend on unmodified natural environments where ecological processes operate freely. The polemical literature documents these values that, to some extent, are substantiated by the technical and scientific literature. They include spiritual, personal renewal, solitude, learning, appreciation of natural processes, scientific, historic, aesthetic and many other values, including recreation.

There is a significant tendency to view wilderness as only a place to recreate. For example, in written testimony submitted to the U.S. House Subcommittee on National Parks and Public Lands, Cliff Merritt (Executive Director, American Wilderness Alliance) stated that "Many Forest Service officials consider wilderness areas largely as recreation areas. This is a major error that, if pursued, will result in the ultimate destruction of wilderness" (Merritt 1989).

One example of this orientation is the tendency to view wilderness as a place to hunt

and fish, and state fish and game agencies, by and large do little to dissuade the public of this image. Another example is the overriding attention given to the issue of recreational use and carrying capacity in the literature of wilderness management.

PRINCIPLES

I noted earlier several factors that threaten the wild integrity of America's precious places. Other writers have documented these threats so I need not discuss them in detail here (see for example General Accounting Office 1989). However, I do wish to briefly discuss some principles that should be applied in wilderness management to deal with these threats and to otherwise respond to various management problems.

1. Maintenance of Ecological Processes and Protection of Wild Integrity Should Govern Management.

The value of our precious places lies in their wildness. We can maintain that wildness only if we allow natural processes to take place wherever we have designated wilderness. All management actions should be judged by the criterion of what impact they would have on ecological processes and wild integrity. Too often, we look upon natural processes as something that has to be tamed or controlled or influenced.

Unfortunately, this orientation carries over into our management of wilderness. It has taken a longtime, but we have finally come to grips with the role of fire, but are we too eager to burn the wilderness? We view lack of fire as something that must be corrected immediately, and thus we see proposals to introduce planned ignitions in wilderness to make up for fire suppression in the past. Planned ignitions in many situations, particularly in the northern Rockies may not be needed because the period of fire suppression is only a fraction of the natural fire frequency. Planned ignition is inappropriate because it is just another way of introducing human influences on a natural landscape.

Another area of human influence over natural processes is that of fishing and hunting in wilderness. Many wildernesses contain non-native fish species, put there for the convenience of anglers. There is a real question whether plantings should continue and whether agencies should work to eliminate non-native species. Hunting undoubtedly changes the natural population structure of game species, as well as the population's reaction to seasonal and yearly changes in forage and precipitation. What are these impacts? Are they acceptable? If the impacts from hunting on natural processes are acceptable, why not impacts from other human activities?

These are important questions not only from the perspective of the impact on the wild integrity of a precious place, but also from the point of view of other recreationists who do want to view wildlife populations that are culturally manipulated.

2. Wilderness Dependent Human Uses Should Be Emphasized, Others Should Be Moved Elsewhere.

People can make many types of uses of wilderness that depend on its wild integrity. For this reason alone, they are special places. We need to identify those uses, such as primitive recreation, spiritual activities, learning about and appreciating wildness and natural processes, and human development, and manage for them. Other recreational uses should be encouraged to occur in different types of primitive settings. Our precious places are simply too much in demand to allow those uses that do not require wild integrity or natural processes to occur in wilderness.

3. Involve the Public in Wilderness Management Planning.

Wilderness exists because a few people had the wisdom to protect it. We've learned that a variety of actors are involved in any given wilderness management situation. To make management work, cooperative efforts with different agencies and citizen groups is essential. We can term this principle developing partnerships, or we can call it simply good management, but interagency cooperation and coordination together with legitimate public involvement is essential to preserving the integrity of America's precious places.

Of particular importance are the crucial cooperative efforts with members of the affected publics. Getting publics involved early in the management planning process can avoid unnecessary conflict, promote communication and education, take advantage of the public's expertise and knowledge, and can build a constituency informed about the complexities and nuances of wilderness management. I note that we have much to learn about developing a dialogue and promoting opportunities for mutual learning with our publics.

4. Avoid Actions that Intrude into Experiences.

Wilderness is as special as it is precious. This specialness is reflected in several lines by Robert Service:

> "Have ever you stood where the silences brood;
> And vast the horizons begin,
> At the dawn of the day to behold far away
> The goal you would strive for and win?"

The vastness can be as much mental as geographical, and the freedom and escape such vastness provides can be easily destroyed by management actions that unnecessarily trespass on one's mind.

All too often we have sought the regulatory route to solving problems, particularly recreational impact ones, that are best settled with creative information and education. A brief review of wilderness management plans indicates, for example, that agencies regulate where people may camp, how they will camp, how many people can camp in a group and how long they can camp. We control but do we educate? We restrict, but do we inform? We limit, but do we instruct? Many of these regulations are as unnecessary as they are ineffective and costly. More importantly, however, they intrude into and conflict with the wildness of the experience, thereby compromising its integrity.

Applying these principles and protecting our precious places will not be simple, easy or economical. But it will be a bargain, for we will have ensured that the legacy of wildness persists, and that our children will come to know and benefit as we have.

I know that springs in Cache Valley can be abrupt, and summer weather will be shortly upon you. The change to summer is not only a change, but brings with it a clearer view of the future that was promised with the birth of spring. Just as streams in summer run clear, allowing us to see the mysteries that were once muddied by the water's hurried rush downhill, our vision of wilderness management is now plain to see. We should be using the rush and enthusiasm of the first quarter century of wilderness management to build the knowledge and wisdom to protect an enduring resource of wilderness — our precious places.

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"IN WILDNESS IS THE PRESERVATION OF THE WORLD"

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ABSTRACT: Passage of the Wilderness Act of 1964 and establishment of the National Wilderness Preservation System represent an historic achievement, an assertion of idealism in a materialist-powered society. The four federal land-management agencies, however, have failed to meet their legislative mandate. Thus Earth Day 1990 provides a singular opportunity to address the unfinished agenda with consideration of a new agency to be called the United States Wilderness Service.

"In wildness is the preservation of the world." With those eight simple words Henry David Thoreau defined for his time and all time a specific and inescapable social responsibility. Thoreau, however, had no way of foreseeing the state of the world as we know it now in the last decade of the Twentieth Century: a planet deeply wounded, troubled by pollution, overpopulation, corruption, violence, and widening disparity between the riches of the rich and impoverishment of the poor, the manifest ills of a technological supercivilization dangerously out of control.

For our particular period, I would add to Thoreau that in the preservation of wild nature lies individual salvation. I don't mean in wildness alone, but in the conscious effort to preserve and perpetuate wildness, for nature and humankind, after all, are indivisible.

"Only in acts of articulate compassion, in rare and hidden moments of communion with nature," wrote Loren Eisely, "does man briefly escape his solitary destiny." Yes, those rare, hidden moments in communion with nature are essential to rediscover the soul and rekindle the spirit, but no less so is the expression of articulate compassion that we celebrate in Earth Day 1990.

In this spirit I review the past and look to the future, with wilderness protected under provisions of the Wilderness Act as a symbol of hope and reason, of respect for the earth as the source of respect for each other. I see the Wilderness Act as a beginning, or a step along the way, rather than an end in itself. Since 1964, more than 100 items of wilderness legislation have been passed by Congress, including the Eastern Wilderness Act of 1975, designating key tracts in the East; the Federal Land Policy and Management Act of 1976, extending the wilderness system to include areas administered by the Bureau of Land Management, and the Alaska National Interest Lands Conservation Act of 1980, adding more than 60 million acres to the system.

Those are positive achievements, enabling us to feel uplifted today by inspiration from the principled, selfless, and far-seeing leaders in the wilderness crusade of a generation ago. They were caring, sharing and giving, articulate and compassionate. I feel privileged to have known many of them, and privileged anew to relate their work and vision to an upcoming generation of leaders and activists.

Nevertheless, Earth Day 1990 should be the time to identify the unfinished agenda,

recognizing chronic weak spots and new opportunities, challenges and needs. I remember the words of Senator Clinton P. Anderson at the dedication in 1954 of the Aldo Leopold Memorial at the portal to the Gila National Wilderness in New Mexico. The Gila 30 years before had become the first designated wilderness, resulting entirely from Leopold's initiative as a Forest Service official in the Southwest. Senator Anderson spoke of the creative commitment of his old friend (who had died in 1948) and then declared:

"We now become trustees of his inheritance. Those of us who may visit within the wilderness have an obligation to see that the work of one generation shall not be sacrificed by those that come after. We have an obligation to make sure that this area may remain untouched for generations and perhaps centuries to come."

Though I was not present at the scene, Senator Anderson later told me of his conversations with Leopold about wilderness, enlisting him in the cause of preservation. I treasure such connections with wilderness advocates, and feel fortunate to have been an observer and recorder of momentous events, and in a small way a participant in them. My personal experiences and readings convince me that preservation of wild places is the best of American traditions. Wilderness is at the heart of the nation. It tells one generation what is right and lasting about all generations and about the land itself.

"Now we face the question whether a still 'higher standard of living' is worth its cost in things natural, wild and free," wrote Leopold, but he was by no means first with this idea. William Penn, even in the colonial period, wanted one acre of forest left wild for every five acres that were cleared. Thoreau had the same idea. "A town is saved," he wrote in the Nineteenth Century, "not more by the righteous men in it than by the woods that surround it."

New York State moved to save the best of its wild heritage in 1892 by establishing the Adirondack Park, then following up two years later with a constitutional amendment declaring that: "The lands of the state, now owned or hereafter acquired, constituting the forest preserve as now fixed by law, shall be forever kept as wild forest lands. They shall not be leased, sold, or exchanged, or be taken by any corporation, public or private, nor shall the timber thereon be sold, removed, or destroyed."

Those citations are well recorded, but I continually discover new evidence of public care and concern. During the four years I spent in Idaho, for example, I came across documents showing that in the late 1920s the governor of the state appointed a committee to consider the wisdom of establishing something to be called a "primitive area" in the national forests of central Idaho. After three years of consultation and study, the regional forester proposed to close approximately one million acres to public roads, buildings and other permanent improvements. The idea received support from all quarters. The chairman of the governor's committee, representing the timber industry, was its strongest booster.

Consequently early in 1931 Chief Forester Robert Y. Stuart approved establishment of the Idaho Primitive Area (in due course to become the Frank Church – River of No Return Wilderness), stating: "The potential value of the Idaho Primitive Area for recreational and inspirational purposes evidently is greater, more susceptible of early realization and more desirable than is the utilization of its material resources."

There was no input, so far as I can determine, from Aldo Leopold, or from the other two Forest Service wilderness pioneers, Arthur Carhart and Robert Marshall. It was essentially a local show, the outcome of a movement on the part of people who care, in collaboration with the resource professionals, who were largely a different breed in those days.

I knew Carhart in his later years, before his death in 1978, and wish he was more widely appreciated. In 1919, as the first landscape architect hired by the Forest Service, he convinced his superiors that the Trappers Lake area of the White River National Forest should remain roadless rather than be made accessible for summer homes. That, as far as I can tell, was the first definitive application of the wilderness idea. Later he did much the same for the Superior National Forest in Minnesota, identifying a large area that could be "as priceless as Yellowstone, Yosemite, or the Grand Canyon – if it remained a water-trail wilderness." It was the beginning of the Boundary Waters Canoe Area Wilderness, renowned because it remains roadless.

Marshall, as chief of recreation in the Forest Service, enlarged national forest wilderness and strengthened regulations to protect it, although his interests cut across bureaucratic boundaries of federal lands. He related actively to progressive citizen concern and was the prime mover in organizing the Wilderness Society. His brother George shared with me a copy of **The People's Forests**, a wonderful little book written by Robert Marshall in 1933, well deserving of re-issue today. In it he proposed a national network of numerous reservations located in all sections of the country, both to make them accessible and to avoid overuse. He defined wilderness in words that ultimately would be strongly reflected in the Wilderness Act (though it came into law 25 years after his death in 1939).

But everywhere in the country wilderness came under attack, pressured by road-building, dam-building, logging, mining, recreation and tourism, those goodies of modern times. Even the Gila Wilderness was threatened by the proposed Hooker Dam. Nor were the national parks any longer safe – it actually took a nationwide campaign to convince Congress to keep dams out of the Grand Canyon.

"How Much Wilderness Can We Afford to Lose?" Such was the challenge raised by Howard Zahniser in 1951 at the Second Biennial Wilderness Conference of the Sierra Club. Zahniser saw test cases everywhere – so widespread that citizen conservationists were continually on the defensive. He called for a bold strategy, an offensive to establish a national wilderness preservation system composed of lands administered by federal agencies.

Zahniser as executive director of the Wilderness Society led the offensive. I can't remember anyone ever calling him by his first name. He was always "Zahnie," the one man in Washington who never lost patience or hope. Not even the most bitter enemies could resist his honest expression of belief that "We deeply need the humility to know ourselves as the dependent members of a great community of life." Zahnie was studious, gentle, soft-spoken, patient, always willing to listen, always resisting the seduction of compromise, a visionary creating reality out of a dream, and never losing heart. "We are not fighting progress," he would say. "We are making it. We are not dealing with a vanishing wilderness. We are working for a wilderness forever."

In those days the Wilderness Society was a small organization with a small staff operating in humble quarters, but emboldened by sense of a grand mission. I think of such highly committed people as Michael Nadel, who at one period in his life had initiated and conducted conservation programs for urban children and who had worked for years on wilderness preservation in the Adirondacks, and Stewart Brandborg, who grew up with the great Idaho-Montana wilderness as his backyard. Once I asked Brandy if he had met Robert Marshall. "But, of course," he answered. "There was the time Bob made his solo hike over the mountains and came to our house, when my father worked on the Nez Perce National Forest." Brandy logged considerable solo time in the mountains, too, particularly during his field study of mountain goats while a graduate wildlife student at the University of Idaho. He was Zahnie's protege and successor when Zahnie died a few months before passage

of the Wilderness Act. Brandy was associated with development of the act from the introduction of the first Wilderness Bill in 1956; he believed strongly in grassroots activism and continues even now as a grassroots leader in his home country of western Montana.

Then there were the field crusaders — individuals like Olaus Murie, who knew the wilderness intimately from his scientific expeditions, a wonderful wildlife artist though he never studied art, and his wife, Margaret, or "Mardy," one of the great women of our time, who still inspires anyone fortunate enough to meet her or to read her written works; and Sigurd Olson, wilderness guide and educator, who at the age of 50 began his creative writing career, enduring many, many rejection slips enroute to producing his classics about the north woods canoe wilderness; and Harvey Broome, my own special mentor, who set aside his law career for his love of wilderness, and without whose concern and leadership the Great Smoky Mountains National Park would now be laced with highways. Harvey taught me many lessons, including the need to resist any and all development within wilderness, for slow attrition inevitably follows. "It must be clear," said Harvey, "that the demand which now looms over us can never be satisfied. To protect what is left we must live with the facilities we now have. The hardest thing will be the decision itself."

Another was William O. Douglas, whose entire life stands as a record of courage, a willingness to go it alone against heavy odds. As a sickly child he gained health and inspiration by hiking in the wild Cascades of Washington State. Years later he brought a wilderness conscience to Washington, D.C. with his celebrated hike along the Chesapeake & Ohio Canal. Detractors detested his activism, demanding he exercise "judicial restraint," but Bill Douglas brushed them off. "A man or woman who becomes a justice," he said, "should try to stay alive; a lifetime diet of the law turns most judges into dull, dry husks."

Through association with such people of bright mind and elevated spirit, I learned that when one person sets his or her sights higher and articulates true compassion, others can hardly fail to be moved. In this respect, I will cite the case of Representative John P. Saylor, of Pennsylvania, the author of the Wilderness Bill on the House side. The first bill was introduced in 1956 by one Democratic senator, Hubert Humphrey, of Minnesota, with eight co-sponsors, and one Republican House member, Saylor. Between June 1957 and May 1964, eighteen hearings were held on the wilderness proposal in both Washington and the West. The bill was passed by the Senate April 10, 1963, by a vote of 73-12, with Clinton Anderson, of New Mexico, and Frank Church, of Idaho, the floor leader, playing key roles. It was a different story on the House side, where the bill was bottled up year after year by Wayne Aspinall, of Colorado, the powerful, crusty chairman of the Interior Committee. The extractive industries that felt public lands were their private domain fought it tooth-and-toenail. The Forest Service and National Park Service fought it, too, in the true spirit of bureaucracy entrenched. Saylor, however, a towering figure of indomitable will, never gave up. "I cannot believe," he said, "that the American people have become so crass, so dollar-minded, so exploitation-conscious that they must develop every little bit of wilderness that still exists." Finally Aspinall acceded: The bill was passed by the House July 30, 1964, with only one negative vote and was signed by President Lyndon B. Johnson in the White House rose garden on September 3, 1964. I recall that when he became ill John phoned me from his sickbed at Bethesda Naval Hospital asking that I help prepare a statement denouncing the killing of eagles in the West. On many fronts John was a thoroughly conservative Republican; he embraced wilderness as a cause of patriotism.

Passage of the Wilderness Act opened an age of environmental awareness and activism, inspiring many people to continue the crusade. I went to California to hike in the San Rafael Wilderness, the first area reviewed under the

1964 act. My companion was Dick Smith, an energetic Santa Barbara newsman who made the Los Padres National Forest his special beat. He knew the area intimately and championed its protection. When he died suddenly in 1977, the mayor proclaimed Dick Smith Week and the whole community mourned. Dick had helped to get a large roadless area adjacent to the San Rafael placed on the wilderness study list – a mosaic of chaparral slopes, Indian cave paintings, sandstone cliffs, and 6,541-foot Madulce Peak – and in 1981 it was named the Dick Smith Wilderness. Rather like Carhart in northern Minnesota and Aldo Leopold in the brushy Southwest, Smith saw something special others had missed.

The historic act of 1964 established a definition of wilderness in law and a National Wilderness Preservation System in fact. It was imperfect on passage, allowing mineral exploration through December 31, 1983, and it remains imperfect today. But the wilderness system has grown and endured, outlasting Reagan-Watt attempts to undermine it, and the principle of wilderness preservation is firmly established the world over.

The passage of the Wilderness Act, despite the opposition of commercial interests and entrenched bureaucracy, demonstrates that Americans are not crass, dollar-minded or exploitation-conscious. They were not in 1964 and are not today, as evidenced by the continued expansion of the National Wilderness Preservation System. Too often Americans have allowed powerful self-serving interests to control decision-making, but when presented with strong valid ideas in the common good they respond with approval and support. A review of wilderness history thus teaches that each of us must be inspired to realize the power of his or her own life and to never sell it short. The timid, the hesitant, the compromisers have failed. The bigger and bolder the program, the greater the chance of success. Individually and collectively, true believers can and do work miracles, if we have faith and hang together, daring to take risks based on principle above political expediency.

The work of the wilderness crusaders of yesteryear inspires succeeding generations to safeguard the national treasures identified and defined in the Wilderness Act. For all of our public lands, wilderness in particular, comprise the most priceless possessions we Americans share as a people.

No other country is so enriched by its parks, forests, wildlife refuges and other reserved administered by towns, cities, counties, states and the federal government. Land is wealth, and we the people ought to hold onto every acre of it in the common interest. Public lands provide roving room, a sense of freedom and release from urbanized high-tech super-civilization. Without public lands there would be no place of substance left for wildlife, which has shared our heritage since time immemorial.

Yet no administration in my lifetime, and quite possibly none in the long history of the Republic, manifested greater antagonism and hostility to the principle of public land than the recent administration of Ronald Reagan. He came to Washington as a self-proclaimed Sagebrush Rebel, surrounding himself with a band of anti-federal zealots like James G. Watt, determined to dismember and "privatize" the federal estate. They left behind a dismal legacy.

George Bush led us to believe that his administration would be different. I felt cheered when he introduced the environmental issue into the 1988 presidential campaign, pledging himself to be an environmental president in the tradition of Theodore Roosevelt. Those words were easy, however. We can see a few improvements, but mostly on the surface. Bush & Company may speak of excellence, but the administration has given us a shallow, ill-informed Secretary of the Interior, plus a rerun of the Reagan wrecking crew, with many of the old crowd still on board. I congratulate the conservation groups for their successful opposition to the appointment of

James Cason, one of the anti-public-lands supernumeraries, as Assistant Secretary of Agriculture in charge of national forests.

The Forest Service is in bad enough shape already. It has lost its way as a professional agency. I speak with many retirees and personnel in the ranks. They are deeply distressed with the lack of courageous leadership and direction from their own leaders. Little remains of the spark and purpose once evoked by Gifford Pinchot with bold ideas and expressions, such as: "The earth belongs by right to all its people and not to a minority, insignificant in number but tremendous in wealth and power." The Forest Service under Pinchot achieved its reputation for square-shooting and fearlessness in a system then — as now — constipated with bureaucracy, bungling and timidity. "It is the honorable distinction of the Forest Service," Pinchot wrote, "that it has been more constantly, more violently and more bitterly attacked by the representatives of the special interests than any other government bureau. These attacks have increased in violence and bitterness in proportion as the Service has offered opposition to predatory wealth."

I wish that "honorable distinction" was being earned anew, yesterday or today, but no such luck. The Forest Service is out of touch with the environmental age, out of touch with the idea expressed by Senator Hubert Humphrey in connection with the National Forest Management Act of 1976. "The days have ended when the forest may be viewed only as trees and trees viewed only as timber," Humphrey said. "The soil and water, the grasses and shrubs, the fish and the wildlife, and the beauty that is the forest must become integral parts of resource managers' thinking and action."

The Forest Service is out of touch because, I fear, Chief Dale Robertson himself is out of touch. He believes that all goes well with business as usual in the same old way. He likes to call the Forest Service "the number one supplier of outdoor recreation in the United States," as though numbers count most, when the truth is that his outfit has been doing a poor job in recreation. Recreation for years has come in last, in funding, and in status up and down the line. The chief talks about a new priority in recreation, which may sound promising on the face of it, but, in fact, decision-makers in his agency time after time follow a course of roading and logging that utterly eliminates choice recreation sites from the national forests.

Chief Robertson now speaks about furnishing "all-American recreation experiences," specifically with more roads for motoring and more ski slopes for downhill skiing, with scant concern for the impact of these activities on the resources. The chief is playing a dangerous game, endeavoring to find public support by appealing to the lowest common denominator of public taste, inviting a gross misuse of public lands.

Chief Robertson and the Forest Service leadership around him show little personal feeling or love for the land. They show scant appreciation of plants, animals, soils, geology, or human history associated with the areas in their charge.

Little wonder that on March 15, 1989, Representative Bruce Vento, Chairman of the House Subcommittee on National Parks and Public Lands, addressed a stern letter to Chief Robertson, following an extensive review by his committee of national forest wilderness management. Representative Vento cited these findings:

"Many national forest wilderness areas are being damaged. Trails and campsites are suffering from inadequate planning, construction, maintenance, reconstruction, and rehabilitation. Meadows are being overgrazed by ranchers and by outfitters. Inappropriate 'privatization' through campsite reservations and quasi-permanent facilities is being allowed. The public and even agency personnel are conducting activities inside wilderness boundaries that are in violation of the Wilderness Act."

The record of the National Park Service is no better. Its leaders resisted the Wilderness Act, contending it was already protecting wilderness under its organic legislation. History has shown this is not the case: In the early 1970s the agency leadership proposed wilderness "enclaves" and "corridors" in the hope of allowing intrusive lodgings and tramways. In more recent years political influences have transformed a professional bureau into a political bureau emphasizing recreational tourism, complete with urban malls, supermarkets, airplanes and helicopters sightseeing overhead, snowmobiling and other motorized activity and artificiality in wild country.

Wilderness has been given low priority. Many National Park Service officials have lost the ability to cope with nature preservation on a large scale--they fail to recognize that roads and hotels and "pleasuring" can be as destructive to wilderness in national parks as clearcut logging is in national forests. It approaches the scandalous that in 1990, more than twenty-five years after passage of the Wilderness Act, national parks like Yellowstone and Grand Canyon still do not contain an acre of classified wilderness.

The central issue as I see it is not management, but the values sought through public policy and defined by it. Land use embodies both science and philosophy, but the philosophy is more important by far. It must come first, based on love of the earth and respect for all creatures with which we share it. How to utilize wilderness, and public lands in general, as an educational and inspirational resource so that oncoming generations respect the natural world is part of the fundamental challenge as we look ahead to the next twenty-five years and beyond.

We need to learn much more about wilderness: where it is and where it was; its physical and psychic therapeutic qualities; its relation to science, art, ethics, and religion; the contributions of individuals who have helped, in their own way, to save it and give meaning to it for society. Since I have been invited to talk of history, let me introduce the name of Samuel H. Boardman, known as "father of the Oregon state parks system," and recount an intriguing episode of Western conservation history.

After his retirement in 1950 at the age of 76, Sam Boardman spent a part of each day, until he died in 1953, writing historic and descriptive sketches of those wonderful state parks. One of the sketches, titled "How a state park was acquired by Washington and missed by Oregon," dealt with Beacon Rock, located 40 miles up the Columbia River Gorge from Vancouver, Washington. Beacon Rock, an imposing geologic feature, stands 900 feet high and is considered second only to Gibraltar in monolithic stature. In 1931 an entrepreneur proposed to take it apart as a source of rock for a jetty being built at the mouth of the Columbia. Sam was concerned: The scenic preservation of the rock meant as much to Oregon as to Washington. It had been offered to Washington as a gift, but Washington didn't want it.

Sam contacted the owner and determined that it might indeed be given to Oregon. He immediately reported to the chairman of the highway commission, a man who was very enthusiastic about parks; in fact, his commission had organized the parks department. "I greeted the chairman with the information that we had a new park," wrote Sam. "His face wreathed in smiles. 'What is it, Sam?' 'Beacon Rock.' The smiles went into a grimace; from his lips there sizzled, 'You are crazy as hell.'"

But Sam persisted. The legislature could pass a law whereby the state was free to accept the gift. "Why should we let the width of a river," reasoned Sam, "destroy a scenic asset woven into a recreational garland belonging to both states? How could we stand by and see the death of a relative, though a bit distant? If such things of beauty were not fought to a saving conclusion, then the waters of Multnomah Falls would be falling through steel pipes for the generation of electricity."

The chairman relented to the extent of giving news of the gift to the Portland papers. The **Oregonian** editorialized: "So far as we know no state in the union now owns a park in another state. It is a gift unprecedented and as such, whether Oregon accepts it or not, is likely to arouse a stronger public interest in this natural monument. It would be a sad commentary upon the intelligence of the people of this section if it be permitted to fall into selfish hands."

That did it. Home pride in the state of Washington was rekindled through the effrontery of a bordering state. "The Rock is saved to posterity," Sam exulted in his memoir. "It is now developed and used by many. While not under the jurisdiction of Oregon it is ours to see and wonder at its birth."

That lovely expression and Sam's bold initiative reflect an ethic, a desire, a passion, a degree of professionalism that rises above profession, an enthusiasm for life and for human purpose. Sam Boardman's strong feeling derived from homeland love, homeland pride, an affinity for wild nature, a yearning to protect and preserve as part of contemporary civilization.

Wild nature is that way. Wild nature is the source of inspiration in art and literature, of feeling for oneself, for others, for all of life. Those who study human condition have given strong supporting testimony. "It is a commonplace of all religious thought, even the most primitive," wrote Loren Eisely that the man seeking vision and insight must go apart from his fellows and live for a time in the wilderness." Loren described the loneliness of humankind in the universe, then adding: "Only in acts of articulate compassion, in rare and hidden moments of communion with nature, does man briefly escape his solitary destiny."

Thomas Merton told it a little differently: of his discovery of new perceptions once he was free of social standards and values he found repugnant, of a society happy because it drinks coca-cola or Seagram's or both and is protected by the bomb, a society imaged in the mass media, advertising, movies, TV, best sellers, and current fads, all the pompous and trifling masks with which it hides its callousness, sensuality, hypocrisy, cruelty, and fear. No art form stirred him more deeply than paleolithic cave painting, with its dynamic power, vitality, and self-realization, an expression of direct awareness, a celebration of the wholeness of communion with nature and with life.

Joseph Wood Krutch also discovered new perceptions once he was liberated from old constraints. As a New York high brow, he was cranky, sick, and unfulfilled, but after moving to the Southwest in 1952, his outlook changed. His biographer, John D. Margolis, describes the transformation:

> His life had ceased to strive for effects. He had ceased straining, and at last was living authentically. No elaborate psychosomatic theory is required to see a connection between emotional distress and physical illness. The uneasiness Krutch felt with his New York career had its counterpart in a chronic malaise. It was hardly coincidental — and a result of something more than the Arizona climate — that Krutch enjoyed more consistent good health than he had since his youth... The desert became a temple, where the former agnostic, now a pantheist, went to worship.

In his New York days Krutch wore the pose of an intellectual elitist. In Arizona he undoubtedly learned a great deal while writing his biography of Thoreau; he wanted to show that each and every person could enjoy experiences like his. "By contact with the living nature," wrote Krutch, "we are reminded of the mysterious, nonmechanical aspects of the living organism. By such contact we begin to get, even in contemplating nature's lowest forms, a sense of the mystery, the independence, the unpredictableness of the living as opposed to the mechani-

cal. And it is upon the recognition of these characteristics that he shares with all living creatures that any recognition of man's dignity has to be based."

The public, unfortunately, has been led to believe by Congress, the federal agencies and major conservation organizations that once an area is designated as wilderness everything will be fine. But things don't work that way. Many wilderness areas are abused and degraded, often by uncontrolled and inappropriate recreation uses; they are staffed by inadequate personnel insufficiently trained.

The agencies simply do not take their responsibility seriously. The decisionmakers, mostly trained in vocational forestry schools, view the earth as a composite of commodities intended for consumption; they have little appreciation of wilderness, if any at all. The Forest Service is oriented to timber, the Bureau of Land Management to grazing and mining, the Fish and Wildlife Service to ducks and deer for hunters, and the National Park Service to crowds and tourism.

Yes, there are able, wilderness-conscious, ecosystem-conscious people at work in these agencies, but they often do their best against heavy odds. They are frustrated and unfulfilled. The agencies provide policy statements, manuals, plans and promises proclaiming the future of wilderness, but the documentation is mostly bureaucratic paperwork. Good people in the ranks want to do more; they deserve a better break.

I propose a place for them — through a very separate branch of government "outside the land management structure," a new agency, to be called the United States Wilderness Service. Since we pay people in government to serve mining, oil and gas, electric power, grazing, logging, and other resource-consumptive interests, why not underwrite a cadre of men and women who will prove the government responsive to the people's wilderness cause?

The Wilderness Service would undertake many missions now unmet. For example, the Wilderness Act directs administrators to gather and disseminate information on the use of wilderness, but this is not done, or done poorly at best. This would be one of the main activities of the Wilderness Service. Conceiving wilderness in its broadest sense, it would explore and illuminate uses relative to wildlife, plantlife, archaeology, history, art, literature, and philosophy, treating them as cultural resources rather than as commodities.

The Wilderness Service would be deeply involved in research into the values of specific ecological types, the threats they face, and the steps required to save them. No bureau performs that kind of service today.

The Wilderness Act furnishes the process for preservation of large tracts of federal lands. But the Wilderness Service would be responsible for a coordinated approach beyond this scope. Some states, inspired by the Act, have developed their own initiatives in preservation. They need an exchange of data and other states deserve the chance to benefit from their accumulated experience. For that matter, other nations in the world, having followed our lead in national parks and wildlife conservation, should be able to learn how wilderness is saved and administered, with technical aid to help them.

Federal land management agencies cannot perform these functions. Their approaches are too narrow and the efforts of their wilderness-oriented personnel are circumscribed. But the new agency, vitalized with the energy and imagination of these people in its fold, and with the single, specific mandate of wilderness, would be the ideal vehicle.

The Wilderness Service, as I perceive it, would not administer land, but it would furnish new ideas for better land administration. It would help to set standards for the amount and types of human use an area can absorb without impairing

its wild quality, hopefully reversing the widespread trend of deterioration and degradation.

We can never allocate enough wilderness, but we should continually improve the administration of areas in the wilderness system. Earth Day 1990 marks a fitting point to re-consider the propriety and proportions of such activities as grazing, hunting, fishing and trapping; fire control; insect and disease control; luxury outfitting with permanent and semi-permanent structures, and aircraft flights over wilderness.

Let us advance the ethical cause by redefining the purpose of all public lands, of reassessing what they do to enrich life in America, in long-range terms of economics, science, and recreation, and beyond them of culture, art and spirituality. Emerson wrote that literature, poetry and science are all homage of humans to the unfathomed secrets of nature.

Places of scenic beauty do not increase, but on the contrary are being reduced in number and diminished in quality. Our responsibility is to see that future generations enjoy the same opportunity accessible to us for solitude and the same sense that nature, rather than humankind, prevails. I recently rediscovered a meaningful statement by Charles Evans Hughes, then governor of New York (and later chief justice of the United States Supreme Court), at the dedication of Palisades Interstate Park early in this century:

"Of what avail would be the benefits of gainful occupation, what would be the promise of prosperous communities, with wealth of products and freedom of exchange, were it not for the opportunities to cultivate the love of the beautiful? The preservation of the scenery of the Hudson is the highest duty with respect to this river imposed upon those who are the trustees of its manifold benefits."

We as trustees of rocks and rills, of wooded templed hills, of the heritage embodied in the Wilderness Act of 1964, need consciously to advance love of the beautiful as a principle through the body politic, through private and public institutions and the professions, so that life may be more elevating and so that Americans may love their country more devotedly the more lovable it is made.

Yes, I can adapt that idea into the practical. "Reasonable land stewardship includes the protection of soil, water quality, and fish and wildlife habitat," Dale Robertson declared in 1974 when he was supervisor of the Siuslaw National Forest in the Northwest. "Short-term economics will not override long-term needs of high quality land management."

The time is long overdue to apply the principle of stewardship, real stewardship, to our entire planet, with public lands in the United States as the exemplars. Society should have its choices, but one choice should be wilderness, whether embodied in a single plant or a great virgin forest, whether a desert or a mountain, a California condor, grizzly bear, or spotted owl, but that image is possible because somewhere that image exists in fact. There can never be enough of it.

I see wilderness as sanctuary of the spirit, the heart of a moral world governed by peace and love. Nuclear weapons will never force nations to join in recognizing the limitations of a fragile earth. Stealth bombers and Trident submarines cannot bring people together as brothers and sisters caring for each other in our common destiny. We should give up the illusion of military solutions and redirect funding, personnel and energy to constructive humanitarian purposes. Let us commemorate Earth Day 1990 with yet a new beginning on a broad front, and pledge allegiance to a green and peaceful planet. For in wildness is the preservation of the world.

NATURAL DISTURBANCES AND BIODIVERSITY IN WILDERNESS LANDSCAPES

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At least three levels of biodiversity can be described, including diversity of species, genetic diversity within species, and the diversity of biotic communities and ecosystems across a landscape. This paper focuses mainly on the third level of biodiversity. It is concerned with the natural processes that interact to create and maintain a diverse mix of plant and animal communities in wilderness areas, and with the ways in which the designation and management of wilderness areas may influence these processes and thus may alter the natural patterns of biodiversity of the landscape level.

The word "wilderness" is used here in a generic sense to refer to any landscape in which natural ecological and geological processes predominate. The general concepts developed below apply to Wilderness Areas officially designated under the Wilderness Act of 1964, and also to undesignated roadless areas in National Forests, to the ecosystems within many large National Parks, and other wildland areas (Houston 1971).

NATURAL PROCESSES THAT CREATE BIODIVERSITY

Nearly all wildland areas contain a diverse mix of biotic communities. This diversity results from the interplay of two fundamental processes that operate in all landscapes. The first process is the response of organisms to underlying variation in the physical environment. This variation is very striking in mountainous areas, where we can readily identify gradients or progressive changes in elevation, geologic substrate, and topographic position. Higher elevations and north-facing slopes typically provide cooler and wetter conditions, and thus support different plant species than the warmer, drier habitats at lower elevations and on south-facing slopes. Even in landscapes with little physical relief, e.g., prairies, there usually are gradients in soil structure, nutrient availability, and other ecologically important characteristics. In general, landscapes containing a greater variety of habitats, as a result of these environmental gradients, tend to support a greater diversity of biotic communities.

The second natural process that creates and maintains biodiversity at the landscape level involves periodic disturbance of biotic communities and the ecological succession that takes place after disturbance (Pickett and White 1985). The kinds of natural disturbances vary from region to region. In the Rocky Mountains, for example, fire, insect outbreaks, avalanches, and landslides are some of the important forms of natural disturbance; in deserts, flash floods may be more important disturbances; fires and hurricanes are important in the Everglades. Regardless of the nature of the disturbance, the results are similar: established plants are killed or injured, and the space that they formerly occupied becomes available for colonization by other plants. Many plant species can only survive in places where they have little competition from

other plants; they become established only after disturbances and persist for a time but are gradually crowded out by other species that are more tolerant of crowding and competition.

The importance of this second process in creating and maintaining biodiversity is well illustrated by the succession of plants and animals after fire in Yellowstone National Park (Despain, in press; Romme and Despain 1989a,b,c). Lightning has ignited fires for centuries on the forested high plateaus of the Yellowstone region, and extensive fires have occurred many times in the past, even before Europeans came into the region. Many of these past fires were high-intensity fires that killed the forest canopy over hundreds or thousands of acres, as occurred again in 1988. The dominant plant species during the first 25 or so years after such a fire are herbs and shrubs, such as fireweed (*Epilobium angustifolium*), many of which that were uncommon in the forests that burned. Some species, like dragonhead (*Dracocephalon parviflorum*) apparently germinate and flower only after a fire, then persist as buried seeds until the next fire (Stickney 1986). Eventually, however, trees become re-established, and after some 200-400 years of succession, the forest again resembles the forest that burned.

In addition to the succession of plant species after fire, there is a succession of animal species. For example, three-toed woodpeckers (*Picoides arcticus* and *P. tridactylus*) are common in recently burned forests, where they drill into the fire-killed snags for beetles and other insects, but they are rarely seen in older forests. Mountain bluebirds (*Sialia currucoides*) and tree swallows (*Iridoprocne bicolor*) also prefer recently burned forests, where they use the fire-killed snags for nesting and perching. These species would decline in numbers if fire were excluded from Yellowstone's forests for a very long time (Taylor 1973, Romme and Knight 1982). However, there also is another group of animals, including the pine marten (*Martes americana*) and the goshawk (*Accipiter gentilis*), that is largely restricted to old growth forests. These species would disappear if the entire landscape burned or was clearcut.

Thus, the maximum diversity of species is likely to exist in a landscape containing a variety of habitats; and habitat variety results not only from the effects of environmental gradients, e.g., elevation and topography, but also from natural disturbances and the successional sequences that follow.

MAINTAINING BIODIVERSITY IN WILDERNESS AREAS

It is important to recognize that these natural processes of biodiversity are dynamic, and that wilderness landscapes are ever changing. This recognition bears on a fundamental question in wilderness management, namely what it is that we are trying to manage for. Some people think of a wilderness area as a place that does not change except as humans alter it. It follows from such a conception that the goal in wilderness management should be to preserve, or, if necessary, to re-create the scene that was witnessed by the first explorers to reach the area before modern human activities changed things. This concept seems to be fundamentally wrong. Reconstructions of the mosaic of communities that existed in the Yellowstone landscape during the last 250 years indicated that the mix of plant communities was continually shifting; fires burned some areas every decade, creating early successional communities dominated by herbs and shrubs, while succession in other previously burned areas re-established forest communities (Romme and Despain 1989a,b,c). This was occurring even in the 1700's and early 1800's, when there were no Europeans in the Yellowstone region to modify natural ecological processes.

Rather than trying to preserve a static scene that we think is the way a wilderness area "should" look, a more effective strategy is to preserve the natural processes that maintain

biodiversity (Graber 1983, Christensen et al. 1989). For example, because lightning-caused fires have long been a primary source of diversity in the Yellowstone landscape, the National Park Service in 1972 changed its former policy of suppressing all fires and began allowing some lightning fires to burn without interference (Despain et al. 1982). Several other large National Parks and National Forest Wilderness Areas have similar fire management policies that emphasize maintaining the natural processes that create biodiversity instead of trying to "freeze" the appearance of the landscape at any particular point in time (Lotan et al. 1985).

Allowing natural disturbance processes to continue operating in wilderness areas seems to be a necessary part of maintaining natural biodiversity, but this is not always an easy task. With some kinds of disturbances, e.g., hurricanes, there presently is nothing we can do to alter their behavior and effects. But there are other kinds of disturbances that we can control, at least to some extent. A good example is fire; we can suppress most fires (though some in 1988 were uncontrollable even with modern technology), and we can intentionally ignite fires. In either case we alter the natural frequency and effects of fire, and we need to consider the potential effects on biodiversity of any proposed policy for managing fires and other natural disturbances in wilderness areas. The very act of establishing a wilderness area may subtly alter the area's biodiversity and the processes that maintain it. Let us then use fire as a specific example as we examine two major issues in the maintenance of biodiversity in wilderness areas: effects of boundaries and effects of different strategies for dealing with natural disturbances.

BOUNDARY EFFECTS ON NATURAL DISTURBANCE & WILDERNESS BIODIVERSITY

Designating an area as wilderness always entails drawing a boundary. The location of this boundary, and the size and environmental heterogeneity of the area it encloses, have profound and long-lasting effects of biodiversity. Generally, the larger a wilderness is, the more species and kinds of biotic communities it will contain. However, a small, mountainous area may support more species and communities than a large, flat area because the pronounced environmental gradients in the former area create so many more kinds of habitats. On the other hand, if many of the species in the small mountainous wilderness are represented by very few individuals, then they may disappear within a short time if there is no longer any suitable habitat available for them outside the wilderness area. Small populations are vulnerable to extinction because of genetic and demographic changes that often take place, and because a local accident or disturbance can eliminate all or most of the population (MacArthur and Wilson 1967, Soule et al. 1979, Wilcox 1980).

The natural processes of disturbance and succession also are profoundly influenced by the size of the reserve. Consider, for example, the effects of the 1988 Yellowstone fires. Extensive, high-intensity fires of this kind have long been a natural part of the yellowstone environment, apparently occurring at intervals of 100-300 years (Romme and Despain 1989a,b,c). Several lines of evidence suggest that the 1988 fires were a nearly natural event in the ecological history of the region. The large size of the fires was a result primarily of unusually dry and windy weather conditions, coupled with the fact that the landscape was covered by extensive forests that had developed since the last extensive fires in the early 1700's (Romme and Despain 1989a,b,c).

The fires in 1988 did not destroy the biodiversity of Yellowstone wilderness. On the contrary, they probably increased biodiversity. Fire history research indicates that the yellowstone landscape had been dominated by closed forests in middle and late successional stages since the mid 1700's and that early successional forests had become increasingly rare

in the twentieth century (Romme and Despain 1989a,b,c). The 1988 fires burned nearly 800,000 acres, thus creating a large expanse of early successional forests that will persist for several decades before succession returns the burned areas to closed forest once again. Despite the enormous extent of the fires, however, there still remains hundreds of thousands of acres of unburned forest that continue to harbor pine marten, goshawk, and the other species that do not thrive in recently burned areas. Yellowstone now has a more even mix of forests in all stages of succession than it has in the last 200 years. It seems, then, that a wilderness area the size of Yellowstone National Park (2.2 million acres) is large enough to absorb fires of this magnitude, and the natural wilderness processes that have shaped the Yellowstone landscape for thousands of years are still operating pretty much as they always have. Yellowstone's biodiversity was maintained or even increased in 1988.

Let us imagine, however, what the effects of the 1988 fires might have been if Yellowstone Park were only 10,000 acres in size. All or nearly all of such a small wilderness area could have burned in 1988, and this one fire might have eliminated its old-growth forest and the associated plant and animal species. Such a disturbance would be a catastrophe, even if the disturbance were essentially natural, because the boundaries of the wilderness area did not encompass a large enough area to accomodate the effects of that disturbance.

One should not conclude from this discussion that every wilderness area must be as large as Yellowstone National Park to be ecologically viable. Natural disturbance in Yellowstone is probably on the extreme end of the spectrum for landscapes within the continental United States (though it probably is fairly typical of many boreal landscapes in Alaska and Canada). In deciduous forests of the eastern United States, for example, a major form of natural disturbance is the falling large, old trees which create openings in the forest canopy in which several species of shade-intolerant trees and shrubs can become established (Pickett and White 1985). This kind of disturbance occurs frequently, but affects only small areas (usually an acre or less); thus all stages of succession can be maintained within a wilderness preserve of several hundred or a few thousand acres. Similarly, ponderosa pine forests, which occur throughout much of the west, historically burned at intervals of decades or years and were far less severe than the fires in Yellowstone's lodgepole pine forests (Arno 1980). It is possible, then, to maintain a natural, fire-created mosaic of forest successional stages within a much smaller wilderness tract of ponderosa pine forest. We need to conduct research in our wilderness areas to discover the kinds of natural disturbances that are important in each particular area and to ascertain the spatial and temporal scales over which those disturbances operate.

MANAGING NATURAL DISTURBANCES IN WILDERNESS AREAS

Recent ecological research has demonstrated the importance of natural disturbance and succession in maintaining biodiversity of wilderness areas. However, it often is difficult to manage specific areas in such a way that these processes can continue to operate naturally. For many years, nearly all federal land management agencies in the United States attempted to eliminate all fires, both natural and human caused, on commodity-producing lands and in wilderness areas. Such a policy, if effective, would ultimately lead to impoverished biodiversity because early successional stages and their associated species would eventually disappear from the landscape (Taylor 1973). As a result of our better understanding of the role of natural fire in maintaining biodiversity, some wilderness areas in the United States now have implemented fire management policies that permit at least some lightning-caused fires to burn (Lotan et al. 1985). However, all fires still are routinely suppressed in many other officially designated wilderness areas.

There are some powerful reasons why many wilderness managers still attempt to prevent natural disturbances like fires. Fires are dangerous. They can easily burn out of a wilderness area and threaten human life, property, and other non-wilderness resources. In very small reserves, it may not even be feasible to allow lightning-caused fires to burn without interference, because they may burn the entire reserve. Managers of many small nature reserves therefore have chosen to suppress all wildfires, but to simulate the effects of natural fires with a program of prescribed burning. Fires are intentionally ignited by managers at carefully selected times when the fires can produce desired ecological effects, yet can be controlled if they threaten to burn a larger area than is wanted.

Some people have proposed that this kind of prescribed burning should be implemented in all wilderness areas, even the very large ones. They argue that uncontrolled lightning-caused fires are too dangerous and unpredictable even in an area as large as Yellowstone, and that the beneficial effects of fire on biodiversity can be obtained by periodically burning small areas under controlled conditions.

This kind of approach is probably our only option in small nature reserves, but for large areas it seems antithetical to the wilderness idea. Fires are admittedly dangerous and unpredictable, but those are both quintessential qualities of wilderness. Moreover, at least some of our large wilderness areas, e.g., Yellowstone, appear to be capable of supporting even large natural disturbances, as described above.

Another reason for not trying to replace natural disturbances with simulated ones is that we do not yet understand natural disturbances and their effects on the biota well enough to really reproduce them. For example, one of the most striking features of the 1988 Yellowstone fires was their heterogeneity. The fires created a complex mosaic of severely burned, moderately burned, lightly burned, and unburned patches (see the photographs in **BioScience**, November 1989, and in **Western Wildlands**, summer, 1989). The makeup of this mosaic has numerous implications for organisms and ecological processes. The spatial distribution of burned forests in relation to stream channels and watersheds will profoundly influence streamflow and the response of aquatic organisms (Minshall et al. 1989); the edge created in previously continuous forest will influence behavior of elk, bears, and other animals (Wallace and Knight 1989); and plant establishment and succession will be different on lightly burned and severely burned patches and in the centers and around the margins of large burned patches (Turner and Romme, in press). The point here is that our understanding of natural fire behavior prior to 1988 was not sufficient to have predicted the kind of heterogeneity that was actually produced by the fires. Had we been trying to simulate natural fires with prescribed burning in Yellowstone, we would not have incorporated the heterogeneity that was so important in the areas that burned naturally in 1988.

Wilderness areas are valuable for many reasons: aesthetic, recreational, scientific, and pragmatic. One value of wilderness that is sometimes overlooked is its value as a source of information. The earth was wilderness for most of its history, and nearly all of its creatures evolved in a wilderness setting. We are only beginning to understand the workings of the natural world. Ecologically intact and functional wilderness areas, where natural ecological and geological processes still predominate, provide unique glimpses into our roots.

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RESTORING BIODIVERSITY IN PARK AND WILDERNESS AREAS: AN ASSESSMENT OF THE YELLOWSTONE WILDFIRES

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ABSTRACT: Scientific management is essential for restoring biodiversity in park and wilderness areas. A fundamental requirement of scientific management is quantitative or measurable standards for judging success. A qualitative goal is also needed to guide action prior to setting quantitative standards. Quantitative standards are a measurable but necessarily imperfect representation of the goal. Goals and standards are the two most important parts of the general procedure that is followed in scientific management. The Yellowstone wildfires of 1988 illustrate the problems that occur when theology replaces science as a means for restoring biodiversity in park and wilderness areas.

INTRODUCTION

The mammoth wildfires that scorched nearly half of Yellowstone National Park during the summer of 1988 were caused by a lack of restoration goals and objectives, a century of fuel accumulation due to fire suppression, and an anti-scientific management philosophy that dominates the thinking of some administrators in the U.S. National Park Service. Why did the Park Service allow these fires to burn in a drought, especially after a century of neglect had created a dangerous wildfire hazard? The answer can be found in a memo written by Mr. Howard T. Nichols, a Park Service Environmental Specialist sent to help in the command center during the Yellowstone wildfires, in which he stated that members of the Yellowstone staff knew "that 1988 was a very dry year" yet they "were determined to maintain the Park's natural fire regime." Underlying the determination of Park Service employees to maintain their perception of a "natural fire regime" is a belief in the wisdom of "nature," or "dehumanized wildness," and a rejection of scientific management.

THEOLOGICAL VS. SCIENTIFIC MANAGEMENT

Many people in the Park Service and supporting organizations regard park and wilderness areas as sanctuaries in which "Mother Nature" resides and rules. In their view, humans must display the same kind of reverence for "Mother Nature" when entering a park as they would show for God in a church. That reverence extends to an illusion that "Mother Nature" is managing these areas, not humans. Therefore, "letting nature take its course" is the only acceptable management strategy. This is "theological management" not scientific management.

Theology is a body of doctrines, opinions or beliefs asserted *a priori*, or without proof, that guide the behavior of a group. For example, the overarching philosophy that guides park policy is that "nature knows best." Such a doctrine of "dehumanized wildness" leads inevitably to the belief that park and wilderness areas are sacred spaces that must be left alone. Using science to

manage such places is unacceptable in principle because it is the equivalent of playing God. Exceptions are made, of course, but intervention is generally rationalized as mitigating human influences.

Unlike theology, science is a body of knowledge arrived at by ordered thinking, observation, experimentation and verification. Although a scientist may hold religious beliefs, science itself must be free of dogma. Science deals with advancing knowledge about the laws that govern the behavior of the physical world and putting that knowledge to work to improve the human condition. For example, if only a fraction of the $120 million used to fight the Yellowstone wildfires had been spent on scientific management over the past fifty years, the number, size and destructiveness of the wildfires could have been substantially reduced.

The philosophy that "nature knows best," which is theological management, is founded on two false premises. The first is that national park and wilderness areas were pristine or untouched by humans when they were set aside. By the time European explorers arrived, much of the vegetation and wildlife in park and wilderness areas was profoundly altered due to thousands of years of Indian use. The area now called Yellowstone National Park, for example, was occupied or visited by Indian people dating back to the arrival of Paleo-Indian or "Clovis" people between 7,500 and 11,500 years ago (Janetski, 1987). Indian occupation extended through the prehistoric period and later included such familiar Indian people of the historic period as the Blackfeet, Crow and Shoshone-Bannock (Janetski, 1987). The Indians were finally extirpated from Yellowstone in 1878.

The biotic communities that we valued enough to set aside as park and wilderness areas were largely created by Indian people to serve their needs. The doctrine of "dehumanized wildness" denies this widespread and important role of Indians in managing vegetation and wildlife, and increasing biodiversity.

The second false premise is that national parks like Yellowstone are large enough to contain large-scale forces like catastrophic wildfires without threatening people and property. As early as 1962, a committee of fifteen members representing eight nations stated in their report on the "Management of National Parks and Equivalent Reserves" that "Few of the world's parks are large enough to be in fact self-regulatory ecological units; rather, most are ecological islands subject to direct or indirect modification by activities and conditions in the surrounding areas" (Leopold et al., 1963).

The removal of Indian people, the suppression of fire, and a century of modifications and external influences have profoundly altered the biotic communities in national parks. Consequently, these areas no longer contain the naturally diverse conditions that existed when they were first observed by European visitors. As the Secretary of Interior's Advisory Board on Wildlife Management, chaired by Dr. A. Starker Leopold, stated in its 1963 report ". . . biotic associations in many of our national parks are artifacts, pure and simple. They represent a complex ecological history but they do not necessarily represent primitive America" (Leopold et al., 1963).

Dr. Leopold elaborated on this point in the last letter that he wrote on the subject before his death, in which he stated that "Our parks are too small in area to relegate to the forces of nature that shaped a continent" (Leopold, 1983). Dr. Leopold then gave examples of park deterioration that included the loss of ancient aspen forests and associated wildlife in Yellowstone due to the overpopulation of elk, and he concluded by saying that "Management issues of this kind involve judgement followed by action. They are not resolved simply by 'allowing natural ecosystem processes to operate'" (Leopold, 1983).

The Canadian Park Service has accepted the role of people in nature and moved forward to embrace scientific management while the U.S.

National Park Service has moved backward by taking refuge in theology. Unlike the U.S. Park Service's decision to let Yellowstone burn, the Canadian Park Service is using prescribed fires based on scientific research to return the forests to a more natural condition. Cliff White, the Canadian fire management coordinator, stated that Canadians cannot accept the notion about fire that "as long as lightning started it, it's God's way." "We can't use that here," he said, "because God's way is too rough" (see Kunzig, 1989).

Park managers in Canada follow a logical step-by-step management process that involves documenting historic conditions; specifying goals for restoring vegetation and fire based on those conditions; specifying measurable objectives for assessing success or failure; intervening as necessary to achieve those objectives; monitoring their success; and revising their plans to incorporate new knowledge or to correct errors. In other words, managers in the Canadian Park Service use scientific management. They are professionals who are comfortable with giving scientific reasons for their actions and standing by the consequences. They are also willing to change management practices as knowledge advances.

While the Canadian Park Service is using scientific management, the U.S. Park Service is relying on theological management in many national parks. The implicit goal of theological management is to leave park and wilderness areas untouched by humans. Success is measured by the degree to which human influences have been eliminated from the parks. The irony of theological fire management is that park managers are dictating the future condition of national parks by trying to eliminate their own influence. They are imposing their own human biases on the meaning and purpose of parks while simultaneously denying their dominant role in nature.

THEOLOGICAL MANAGEMENT AND SCIENTIFIC BIAS

Theology prevents the U.S. Park Service from changing, and forces Park Service administrators to continually use new arguments to defend old doctrines. Inevitably, adherence to the philosophy of "letting nature take its course" compromises the objectivity of science. Those who subscribe to this philosophy reject in advance any knowledge, proposed research or insights that question existing policy. Thus the Park Service often spends precious resources to hire sympathetic scientists to conduct research that is designed to fend off criticism rather than to answer questions that are designed to improve management practices.

One of the most troubling examples of possible bias is the repeated use of a statement by the Park Service that large-scale fires only occurred in Yellowstone every 200 to 400 years. In fact, this alleged 200-400 year fire cycle is the single most important defense used by the Park Service to justify the 1988 wildfires as a natural event. Evidence for this fire cycle, however, comes from a single study (Romme and Despain, 1989), and the analysis of the data in that study is seriously flawed.

Romme and Despain (1989) conducted their study on a 320,000 acre area of the subalpine plateaus and mountains in Yellowstone National Park. This is precisely the environment in which they claim Indian burning was minimal and fire suppression was only effective for the past 30 years. Therefore, they conclude that fuels have not accumulated due to the effects of fire suppression and the elimination of Indian burning. They argue that this means the conditions that led to the wildfires of 1988 were natural, including fuels and weather. Therefore, the fires were also natural.

Romme and Despain (1989) documented the percent of the study area that was burned during fifty year periods between 1690 and 1988. Using these data, and the presumption that fuel

conditions were natural, they state that "Our conclusion is that the fires of 1988 were more or less a natural event in the ecological history of Yellowstone Park, a perturbation such as might occur every 200 or 300 years." As Figure 1 shows, their selection of fifty year periods for the display of their data does give the false appearance of a 300 year interval between large scale fires. Both their conclusion, and the method they selected to display the data from which their conclusion was derived, are convenient because they support existing Park Service fire policy. Unfortunately, their analysis is deceptive and wrong!

As Figure 2 shows, breaking Romme and Despain's (1989) data into smaller ten year periods changes the picture substantially. The period from 1690 to 1740 was characterized by fires in every decade while the period from 1940 to 1988 was nearly free of fires except for the massive wildfire of 1988 (Figure 2). Thus any conclusion about these two periods that is based on the assumption that they are similar is invalid. Consequently, Romme and Despain's (1989) own published data contradicts their conclusion and shows that the wildfires of 1988 were unprecedented in the period studied.

Romme and Despain (1989) also argue that the elimination of Indians in 1878, and the implementation of a fire suppression policy in 1886, had no effect on fuels in Yellowstone National Park. Again, their own data contradict their statement as can be clearly seen in Figure 3. The long period of frequent fires ended almost abruptly between 1878 and 1886, with the exception of only one decade prior to 1988. This means that available fuels did accumulate in Yellowstone for over a century. These fuels were critical to the size and severity of the 1988 wildfires.

Finally, as Figure 4 shows, there is a dramatic difference between the "Indian and lightning fire period" in Yellowstone (1690 to 1886) and the "fire suppression and let burn period" (1886 to 1988). This difference distinguishes the historic natural fire cycle in Yellowstone from the unnatural fire cycle that was created by the intervention of European settlers. The historically unprecedented 1988 wildfires in Yellowstone are a conspicuous example of the potential magnitude of future fires that will occur as part of this unnatural fire cycle.

RESTORING BIODIVERSITY

The U.S. National Park Act of 1916, as well as acts establishing individual park units, stress "naturalness" as a primary goal for the creation and management of national parks. The U.S. Wilderness Act of 1964 also uses the preservation of "natural conditions" as one of the goals for wilderness (Bonnicksen and Stone, 1985). The problem is that "natural" is not defined, so restoration ecologists have no clear goal for guiding restoration projects (Kilgore, 1984). Ambiguous terms like "natural" require further clarification before they can serve as goals for restoration ecology.

There are three broad categories of restoration goals: structural, functional, and holistic (Bonnicksen, 1988a, 1990). Structural goals concentrate on the elements or parts of biotic communities, such as species composition and the arrangement of those species in space. Functional goals do not include the structure of biotic communities because function, such as wildfire and plant succession, are more important. Holistic goals are comprised of both the structural and functional attributes of biotic communities. Therefore, both attributes of biotic communities are considered equally important as standards for measuring the success of holistic goals.

Biodiversity is a structural goal because it focuses on the number and kinds of "things" in a particular area. The arrangement of "things" in horizontal and vertical space, and time, may also be essential attributes of biodiversity. The number of different species or within-species

genetic variations are examples of measurable attributes of biotic communities that can be used as standards of authenticity for the historical period. Similarly, knowing the relative proportions of aggregations in vegetation mosaics and their seral stages is often essential for achieving this restoration goal. The relative size of plant and animal populations, or aggregations, may also be important in restoring biodiversity. A restoration ecologist could also use one of several diversity indexes to measure evenness in the distribution among species and aggregations. Statistical pattern analysis of aggregations may also be important, especially measures of randomness, clumping, or uniformity, and the intensity and grain of the patterns. Measures of the insularity of communities may also be critical to sustainable management of biodiversity.

The biodiversity goal is consistent with the definition of naturalness provided by the 1963 recommendations of both the Leopold Committee and the National Academy of Sciences Advisory Committee to the National Park Service on Research. The Leopold Committee suggested that "the goal of managing the national parks and monuments should be to preserve, or where necessary to recreate, the ecologic scene as viewed by the first European visitors" (Leopold et al., 1963). The committee tempered its recommendation, however, by stating that "if the goal cannot be achieved it can be approached. A reasonable illusion of primitive America could be recreated" (Leopold et al., 1963). Similarly, when referring to this recommendation, the National Academy of Sciences report cautioned that "the ideal, though admirable, may not be fully attainable; yet it is desirable to move in that direction" (National Academy of Sciences 1963). These recommendations were also adopted by Secretary Udall and incorporated into the administrative policies of the Park Service (U.S. National Park Service, 1968). This definition of naturalness includes biodiversity but it is also more comprehensive because ecological processes are an important part of "a vignette of primitive America."

Restoring biodiversity in a park or wilderness area where naturalness is the primary goal requires not only a quantitative description of biodiversity, which serves as a standard for restoration, but also a description of the disturbance history and ecological processes that led to, and sustain biodiversity. The disturbance history of a biotic community should be assessed in a systematic manner that considers the agent of disturbance; that is, whether or not that disturbance was caused by human or non-human forces, or an interaction between both forces. The types of disturbances that affect particular biotic communities must also be determined, as well as the scale, frequency, intensity, and impact of the disturbances.

It is also important to know the agent responsible for the disturbance history of a community. For example, the historic biodiversity of Yellowstone National Park cannot be restored by chance lightning fires. Indian fires interacted with lightning fires to maintain vegetation in a mosaic pattern that supported a diverse and abundant variety of wildlife and plant species. Today many lightning fires do not burn in a natural manner because they no longer interact with the effects of Indian fires. The vegetation mosaic that resulted from the interaction of Indian-set fires and lightning fires sustained a high level of biodiversity in Yellowstone. The unnaturally large scale of the 1988 wildfires has substantially reduced that biodiversity in many areas of the park.

Elimination of Indians as a source of fires has resulted in succession toward more shade tolerant tree species, thickening understory vegetation, heavier fuel accumulations, and a concomitant increase in the potential for more catastrophic wildfires. Lightning fires cannot be allowed to burn in these forests (Bonnicksen, 1989a, 1989b). Therefore, if the agent of disturbance is gone then the effects of the disturbance must be simulated. In the case of Yellowstone, this means that prescribed burning to simulate Indian fires will be an essential and continuing part of scientific management.

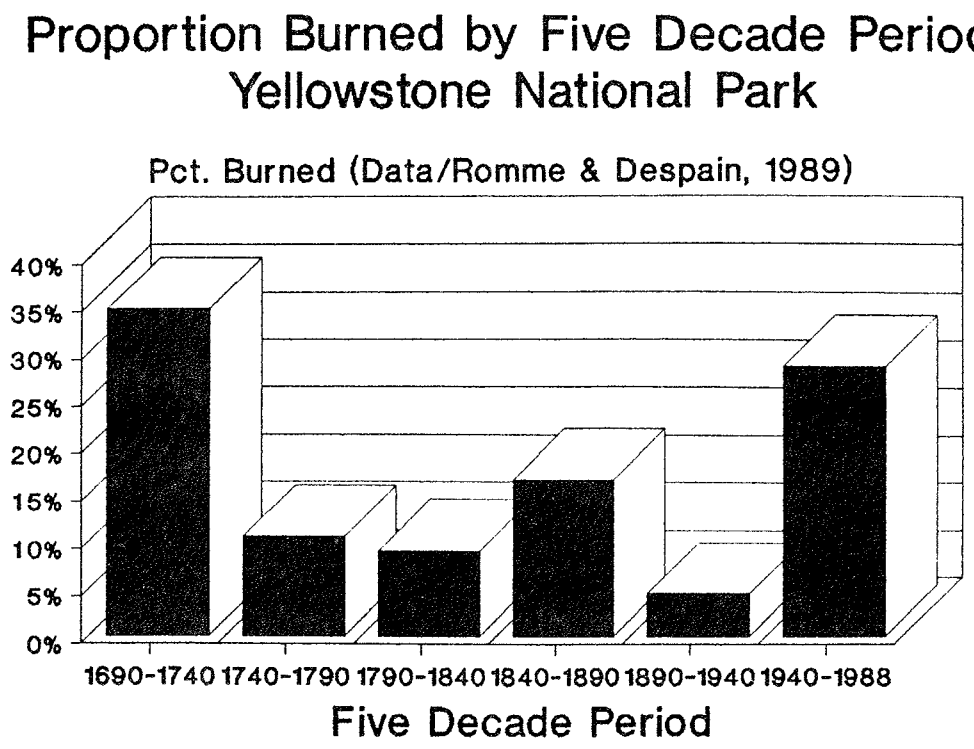
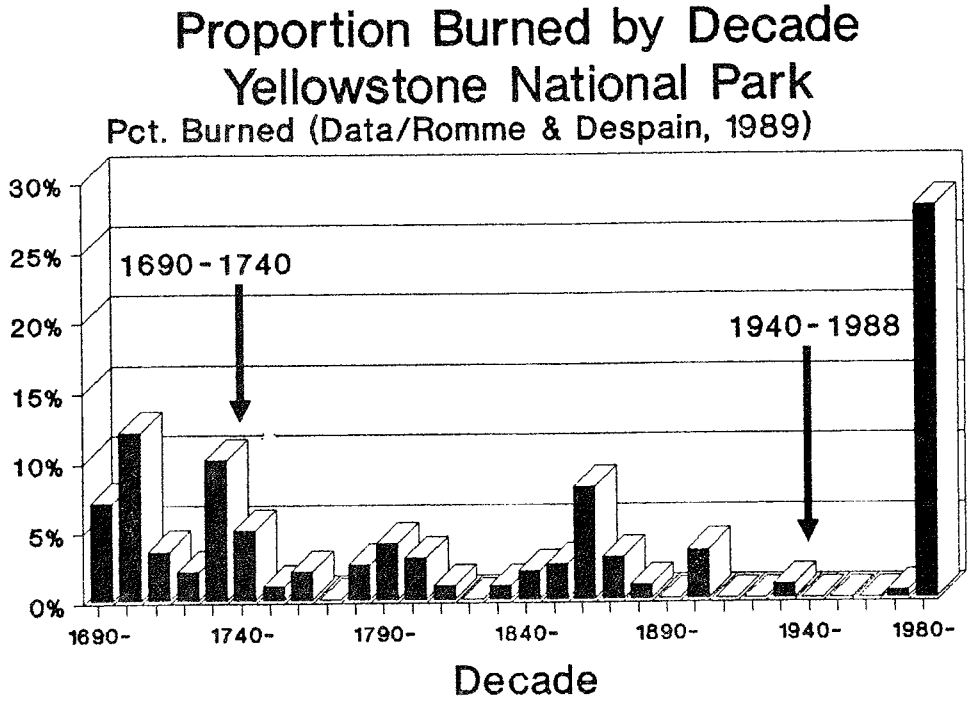


FIGURE 1



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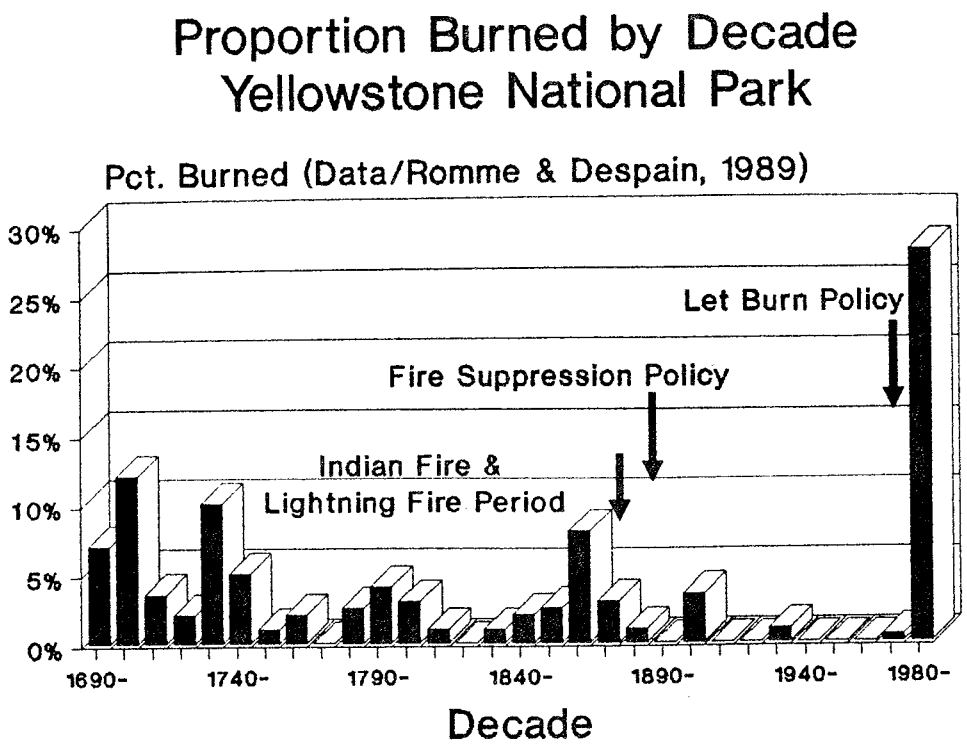

FIGURE 3

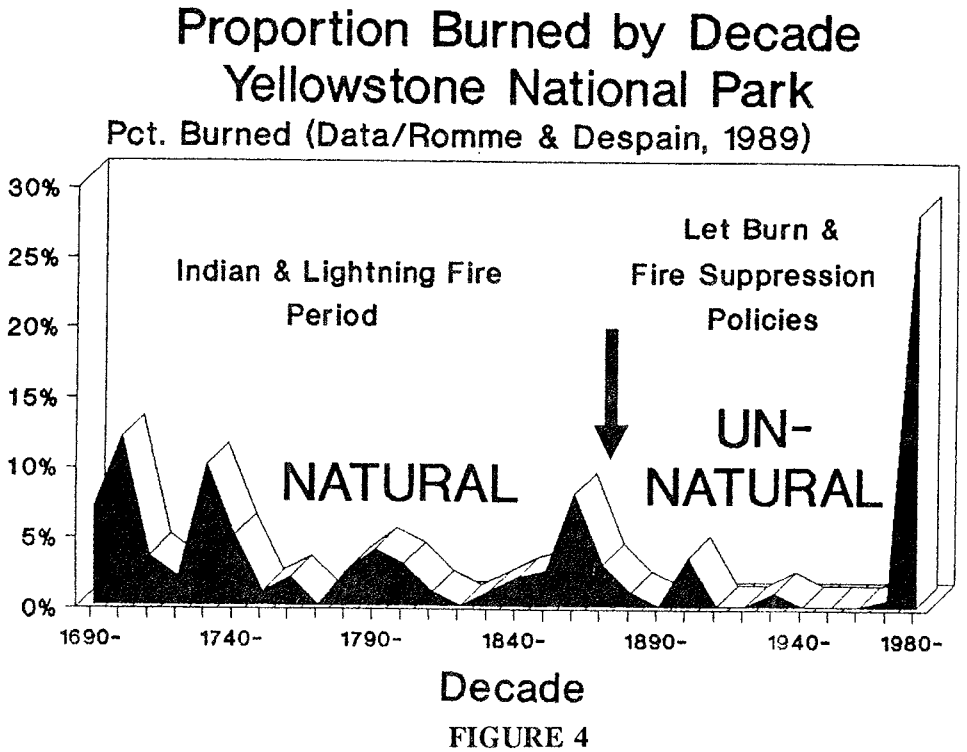

FIGURE 4

CONCLUSION

The Yellowstone wildfires of 1988 have stimulated a long overdue discussion among resource professionals and the public about the objectives and management of our national park and wilderness areas. Understanding the two management philosophies that underlie our choice for the future--theology and science--is an essential part of that discussion. The selection of theology as our guiding philosophy takes away the option of making further choices. Eliminating the influence of humans is all that is required to insure the success of theological management.

In contrast, the selection of science as our guiding philosophy requires humans to play an active role in managing the environment. In my opinion, scientific management will insure that our national parks continue to serve their original purpose of providing for "the enjoyment of the people," and preserving naturalness as stated in legislation and the inscription on the stone gate to Yellowstone National Park. Theological management will only satisfy the religious needs of a small but influential group. In either case, the choice that is made today will have irreversible consequences for the future of our national park and wilderness areas.

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IMPACTS OF RECREATION ON BIODIVERSITY IN WILDERNESS

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ABSTRACT: We discuss seven recreational impacts on biodiversity in wilderness areas. These include: 1) construction of trails, 2) trampling of vegetation and soils on trails and campsites, 3) collection and burning of wood in campfires, 4) water pollution associated with camping activities, 5) unintentional harassment of animals, 6) hunting, fishing, and associated management programs, and 7) grazing by recreational packstock. All of these activities can be considered detrimental because they alter the natural processes and functions of ecosystems. The activities which have caused the greatest impact on diversity at a regional scale are fishing, hunting, and associated management practices. None of these perturbations, however, have been studied in sufficient detail to assess their long-term impact.

Since passage of the Wilderness Act in 1964, the National Wilderness Preservation System has increased to its current size of 91.5 million acres. The intent of the Act is that each wilderness area should retain "its primeval character and influence" and should be "protected and managed so as to preserve its natural conditions." Protecting and managing this large acreage is a challenge, particularly given chronic understaffing and underfunding. One of the primary challenges is protecting wilderness resources from the throngs of recreational users drawn to wilderness. Enjoyment of wilderness and the recreational opportunities it provides is an important purpose of wilderness designation. But recreation is only one of many wilderness values and it should not be allowed to greatly compromise the nature preservation goals of wilderness.

Concern for the preservation of biodiversity parallels those concerns that led to passage of the Wilderness Act and subsequent wilderness legislation. Succinct definitions of biodiversity are hard to come by. The basic concern is that the diversity of life on Earth is being reduced, at a variety of spatial and temporal scales, and that we should do what we can to preserve this diversity. While the objectives of preserving biodiversity and preserving wilderness do not coincide precisely, they clearly overlap. Therefore, it seems worthwhile to look at how recreational use of wilderness affects biodiversity. Recreation is both a threat to wilderness and a value of wilderness. What is the relationship between recreational use of wilderness and biodiversity?

WHAT IS BIODIVERSITY?

For such an intuitively appealing concept, biodiversity defies simple definitions. Most definitions deal with the diversity of entities, at some level of the biological hierarchy, within some variably-sized space. Noss and Harris

(1986) suggest that we be concerned with diversity at the following levels: genes and gene complexes, individual organisms (genotypes and phenotypes), demes/populations, races/-subspecies, species, guilds, communities, ecosystems, landscapes, biogeographic provinces/biomes, and the biosphere. The diversity of any of these can be considered at various spatial scales. For example, the diversity of species in a localized area, such as a forest stand, might be very different from the diversity of species across a landscape or across a region. A perturbation that reduces diversity at the stand level, but not in the region, is not as significant as one that reduces diversity across the entire region. Some have also expanded the concept of biodiversity beyond biological entities to include diversity of process, structure, and function.

The concept is further complicated by the various connotations that accompany the word diversity. Traditionally, diversity has been represented by both richness and equitability or dominance. Richness refers to the number of different entities, the number of species in a community, for example. Equitability is also relevant because diversity declines as dominance by one or a few entities increases. A forest stand in which there are three tree species, one of which is dominant, is less diverse than a stand in which all three species codominate. Beyond these traditional concerns for richness and equitability, many have suggested that the goal of preservation should be to maintain characteristic "native diversity" rather than to maximize richness or equitability (Noss and Harris 1986).

IMPACTS OF RECREATIONAL USE

In the rest of this paper we will discuss recreational impacts on wilderness, and examples of the influence of recreational use on diversity--at several levels of the biological hierarchy and at several spatial scales. This discussion will be, of necessity, highly selective and largely anecdotal. Definite studies are largely lacking. We will conclude with an attempt to suggest the situations where recreational use poses the most serious threat to the biodiversity of wilderness areas.

Seven types of recreational impact are common and potentially significant in wilderness.

1. Construction of trails. Trails are constructed and maintained to provide access to the wilderness. In addition to the trampling impacts associated with trail travel (see below), trail construction can alter the local microclimate and topography dramatically. Moisture conditions are changed, where drainage systems are intercepted and through removal of trees and brush. Tree and brush removal also increases direct precipitation and light intensities and decreases evapotranspiration rates (Dale and Weaver 1974). Common topoedaphic changes along trails include superimposing a flat surface on a steep slope, depositing debris below the trail, creating or removing bare rock faces, and creating a trail tread of imported material (e.g. gravel)(Cole 1981). Generally, these changes are confined to narrow trail corridors several meters wide.

Trails may also impact species composition and interactions by creating edge. The increased vegetation heterogeneity associated with edges usually results in an increase in species diversity and density (reviewed by Reese and Rati 1988; but see Lovejoy et al. 1986). Although this increased diversity has traditionally been viewed as favorable by natural resource managers (Leopold 1933), it has recently been perceived in a negative light. This is because edge species may result in declines of habitat-interior species through predation, competition, or parasitism (reviewed in Lynch 1987). The placement of a right-of-way (e.g., trail) through a habitat creates corridors that are long and narrow and which are maintained to keep vegetation out. The edges that are formed are often abrupt and uniform so do not necessarily mimic naturally-created edges. Chasko and Gates (1982) studied bird populations in transmission-line corridors which

bisected an oak-hickory forest. They noted an increase in grassland and mixed-habitat species inhabiting the corridor as well as higher levels of nest predation and cowbird (*Molothrus ater*) parasitism. Although not documented, the impact of trails in wilderness may have a detrimental effect on some species.

2. Trampling of vegetation and soils on trails and campsites. Where people and livestock walk, trampling removes and abrades vegetation and organic matter and compacts mineral soils. The result is loss of vegetation, change in understory species composition, and exposure of compacted mineral soils. Most of this impact is localized, being confined to the immediate vicinity of trails and campsites. In a portion of the Eagle Cap Wilderness, Oregon, Cole (1981) estimated that no more than 0.5% of the area had been altered by the trampling of trails and campsites.

3. Collection and burning of wood in campfires. Around popular camping areas, collection of wood for fires leaves large areas stripped of all woody fuels. Campers also remove brush and lower limbs, and fell standing trees (Bratton et al. 1982). This has wide-ranging effects, from increasing erosion potential (by removing large decaying wood that creates check dams) to loss of habitat for animals. The area affected is even smaller than that affected by trampling, however.

4. Water pollution associated with camping activities. Camping activities can pollute aquatic ecosystems, although neither the prevalence nor severity of this problem is known. Taylor and Erman (1979) report changes in basic lake ecology in Kings Canyon National Park, California, that they attribute to the cumulative effects of many years of shoreline camping and pollution. They found that heavily-used lakes had more rooted aquatic plants, more bethic macroinvertebrates, more dissolved iron, and less dissolved nitrate than lightly-used lakes. They hypothesized that recreational use increased trace elements, such as iron, that formerly limited plant growth. Growth of plants and macroinvertebrates was stimulated by these higher elemental concentrations and this increased growth depleted available nitrates.

Impacts to aquatic systems could be more widespread than those to terrestrial systems, because water moves. Again, we simply do not know much about either severity or prevalence.

5. Unintentional harassment of animals. Another poorly-understood impact is unintentional harassment of animals. Harassment results when visitors intrude into animal habitat and disturb them. Camping at a desert waterhole, for example, can keep animals from using the water. Rock climbing can disturb raptor nesting sites. Entry into grizzly bear habitat can displace bears or, where bears habituate to humans, lead to encounters that eventually result in destruction of the bear. As with water pollution, these impacts can be widespread because animals are mobile. Impacts can be felt far beyond the local area where the impact originally occurred.

6. Hunting, fishing, and associated management programs. Non-native fish have been planted in wilderness and the ranges of game fishes have been artificially expanded (Behnke and Zarn 1976). For example, since the 1800s, approximately 67 fish species have been successfully introduced into the Colorado River Basin, raising the total number of fish species to over 100 (Carlson and Muth 1989). This has resulted in impacts on native fish populations and has added another trophic level to certain aquatic systems. Hybridization has occurred, altering gene complexes and the purity of races (Behnke 1979, Ryman and Utter 1987, Trotter 1987). Exotics have contributed to the demise of 12 of 24 extinct fishes in North America (Williams and Nowak 1986). Angling has additional impacts on the structure of fish populations.

In wilderness, management of game animals has involved fewer introductions and range extensions than management of fisheries.

Hunting, however, has had important effects on animal behavior, population structure, and species distributions. Geist et al. (1985) make the intriguing point that for certain species, such as bighorn sheep, hunting and hiking are incompatible. Hunting makes sheep wary of approaching humans, so they are readily displaced by hikers even outside the hunting season.

7. Grazing by recreational packstock. A final set of impacts is common wherever grazing by recreational stock is permitted. Again, even descriptive data on the significance and prevalence of impact is minimal. Grazing can reduce vegetative cover and change species composition, because some species are better adapted morphologically to withstand grazing and trampling and because certain species are grazed preferentially. Heavy grazing can make a meadow susceptible to invasion by alien species. Many of the grazing areas in the Bob Marshall Wilderness, Montana, for example, are now dominated by the aggressive alien grass *Poa pratensis* (Kentucky bluegrass), a degraded state from which they are unlikely to change (Johnson 1982). In the Eagle Cap Wilderness, Cole (1981) estimated that the portion of the wilderness disturbed by packstock grazing was several times the portion disturbed by trampling on trails and campsites.

IMPACTS ON BIODIVERSITY

Now we will discuss some examples of how recreational use of wilderness affects diversity at several levels of the biological hierarchy. Data are minimal at best and most examples will refer more to richness than to equitability. The best examples of impact below the species level (genes, populations, and races) are those resulting from hunting, fishing, and associated management practices. Introductions and translocations of game fish and wildlife have resulted in the loss of genetically distinctive races and subspecies. This loss has reduced genetic diversity at both local and regional scales. For example, the Colorado River cutthroat trout (*Salmo clarki pleuriticus*) is a geographical race that had been isolated to the upper Colorado River basin. Historically, it was the only trout that occurred in all of the famous Colorado trout streams. The stocking of nonnative fishes, such as brown (*Salmo trutta*) and rainbow (*S. gairdneri*) trout, resulted in hybridization between native cutthroat and these nonnative species. Unlike most hybrids, the hybrid of cutthroat and rainbow trout was fertile and could reproduce. Once hybridization began, it spread rapidly. These introductions of nonnative trout, therefore, resulted in the virtual elimination of pure Colorado River cutthroat trout throughout its range (Behnke and Benson 1980).

Although genetic diversity has tended to decrease as a result of recreation, there are certain examples of increases in behavioral and phenotypic diversity within species. The different behaviors associated with hunted and non-hunted wildlife populations provides a good example of increased behavioral diversity. For example, behavioral responses of bighorn sheep (*Ovis canadensis*) to humans differ between areas where they are hunted and where they are protected (King and Workman 1986). Likewise, bald eagles (*Haliaeetus leucocephalus*) showed differences in behavior to a canoe on two rivers less than 50 km apart but which had different levels of boating activity (Knight and Knight 1984). The removal of large dominant males from a hunted population can result in such behavioral changes as abnormal exertion by young males during the rut and even decreased female reproductive success (Hutchins and Geist 1987). Animal harassment and even the unintentional feeding of animals, from grizzly bears to squirrels, changes the behavior of some individuals, increasing behavioral diversity.

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The phenotypic diversity of vegetation can be increased by trampling. Small, prostrate plants are better able to survive trampling than large, erect plants. Certain species have enough phenotypic plasticity to exist and reproduce as short, prostrate plants when subjected to frequent

trampling, although they are typically erect when not subjected to trampling. This phenomenon has been most completely documented for species that grow in lawns (Warwick and Briggs 1979), but is likely to occur in wilderness settings as well.

Recreational impacts on the species diversity of local communities — Whittaker's (1960) alpha diversity — are complex. The general pattern suggested is that of increasing species richness to be maximized at intermediate levels of disturbance conforms to theories advanced by Grime (1973) and Connell (1978). For example, some grazing by packstock is likely to produce small disturbed spots that can be colonized by weedy invaders without the loss of any original natives. With heavy grazing, however, fragile and palatable species are likely to disappear, reducing richness. Most places that experience substantial recreation use show declines in species diversity, however. For example, Cole (1985) studied the effects of controlled levels of trampling on six vegetation types in western Montana. On average, the number of species was reduced by 25% and 50% after 75 and 400 walks, respectively. The removal of downed woody materials and brush from large areas around campsites, to build fires, is likely to decrease the diversity of insects, small mammals, and birds.

Most of this decrease in alpha diversity is only locally significant. Certain communities are depauperate, but diversity at the landscape or regional level is unaffected. There are several instances where there may be large-scale decreases in species diversity, however. This may occur where large mammals or birds are displaced from large areas. An example of where this may occur is along Pacific coast rivers during winter where an avian-scavenging guild is impacted over an entire region by recreational boating. The guild members — consisting primarily of bald eagles, crows (*Corvus* spp.), and glaucous-winged gulls (*Larus glaucescens*)-- are nearly obligate scavengers on carcasses of spawned anadromous salmon (*Oncorhynchus* spp.). Boating activity along these rivers greatly decreases the ability of bald eagles to forage (Knight and Knight 1984, Skagen et al. submitted). Other guild members are unable to utilize salmon unless eagles have already opened the carcasses. If eagles are not able to feed, therefore, other scavenging species will decline or disappear, reducing the overall diversity of these ecosystems during winter.

At levels of the biological hierarchy above the species level, recreational impact has tended to increase diversity. The planting of trout in formerly-barren lakes has added another trophic level in many lakes and streams. Trail construction and campsite development both contribute new community types, increasing the diversity of communities in the landscape-- Whittaker's (1960) beta diversity. Grazing of packstock also creates new community types. Three of the eleven plant communities and phases that Johnson (1982) found in grazing areas in the Bob Marshall Wilderness were dominated by nonnative species — new plant communities created by grazing pressure. However, whether an increase in biotic diversity through the introduction of exotic species is worthwhile is questionable.

Recreational use seldom affects the diversity of biological entities above the scale of localized communities. Ecosystems and landscapes in wilderness are affected by such programs as fire management, insect and disease management, by non-conforming uses such as grazing of domestic livestock and mining, and by external influences such as air pollution. But recreational use cannot compete with these other agents at these large scales.

CONCLUSIONS

All of these effects of recreational use on biodiversity can be considered detrimental because they represent deviations from natural conditions. Even those that increase diversity conflict with the goals of wilderness management

and the notion of maintaining "native diversity" (Noss and Harris 1986). Certain of these impacts can be judged more serious than others, however. Those impacts that affect diversity at the larger spatial scales are more significant than those that only affect the diversity of local areas. Those that decrease richness are probably also more detrimental than those that increase richness. Using these criteria we offer the following suggestions about which sources of impact are most serious, which ecosystems are most threatened, and which components of ecosystems are most threatened.

The recreational activity that has caused the greatest impact on diversity at the landscape and regional level is fishing, hunting, and associated management practices. These activities have depleted and mixed genetic stocks, reducing the number of distinct subspecies. Hunting and game management practices have caused the development of unnatural animal populations. Structural characteristics (ages, sizes, and sex ratios), behaviors, and distributions have all been altered, across entire regions in many cases. Hunting also predisposes certain species to impact from so-called non-consumptive uses, such as hiking. Across the entire National Wilderness Preservation System we feel there can be little doubt that these are the recreational activities that most compromise the goals of both wilderness preservation and preservation of biological diversity.

Other activities that have probably reduced diversity at landscape or regional scales are animal harassment, grazing by packstock, and water pollution. None have been studied in sufficient detail to be certain how prevalent or severe these problems are. Grizzly bears have been impacted by recreation over their entire U.S. range; the same may be true of other large mammals. These impacts manifest themselves in population structure, genetic composition, and behavioral modifications, as well as in distributions and resulting effects on down the trophic levels. Where packstock are common and most existing meadows are grazed, this represents a significant compromise of wilderness preservation values, because meadow types may be degraded over their entire range. To avoid this, Sequoia and Kings Canyon National Parks have designated a representative example of each meadow type in the parks as off-limits to stock use. More wilderness areas might consider emulating this approach to preservation of biodiversity in the face of packstock use. Finally, water pollution can alter aquatic ecosystems at the landscape and regional level. This would be most likely in places with heavy use and scarce water resources. Certain wildernesses, such as the Pecos in New Mexico, have a small number of lakes, all of which are popular destination areas. It is likely that all of these lakes have been dramatically changed by historic use and resulting pollution. But we do not know.

The most threatened ecosystems are those that are rare but attractive to recreationists and those affected by the most disruptive uses. Aquatic ecosystems are probably the most at risk. Lakes and streams are the most common destination areas of wilderness visitors. They have been changed by fish introduction and planting programs, by angling itself. and by water pollution. Moreover, the mobility of water means that impacts are not confined to the point of origin.

Other ecosystems that may be threatened in some places are riparian ecosystems and meadows and grasslands favored by recreational packstock. Both ecosystems serve as major attractants and destination areas and, in certain environments, are rare. Riparian strips in arid environments may be heavily impacted and all riparian strips within a landscape or large wilderness may be altered. Grazed meadows and grasslands also can be seriously altered across their entire range.

The most threatened ecosystem components are probably the various components of aquatic ecosystems, from native fishes to phytoplankton. The implications of introducing an additional

trophic level in so many places will have ripple effects throughout those systems. Outside aquatic systems the large mammals are probably most affected, primarily on account of their large ranges. Impacts are not confined to the immediate vicinity of the impact source.

Recreational use of wilderness is not the primary threat to biodiversity and wilderness preservation. Fire management policies, non-conforming uses, and external threats all threaten biodiversity in wilderness more than recreational use. Of the recreational activities that do occur in wilderness, however, we should be most concerned about fishing, hunting, and associated management. We should seek ways to manage these activities such that impacts on biodiversity are minimized. We should learn a lot more about aquatic systems, which appear likely to be the most threatened ecosystems. We should also learn more about the impacts of animal harassment and the impacts of packstock on meadows and grasslands.

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THE ROLE OF WILDERNESS IN PROTECTING BIODIVERSITY

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ABSTRACT: Arguments for and against Wilderness designation often revolve around decidedly unecological themes, such as commodity values, recreational opportunities, and esthetics. Yet one of the strongest arguments in support of Wilderness is ecological: the preservation of biodiversity. Wilderness Areas are important reservoirs of biodiversity, and their value increases as unprotected wildlands are developed. However, in recent years some writers have argued that Wilderness preservation is counterproductive to good wildlife management. Upon closer examination, it can be shown that: (1) most of the ecological arguments against Wilderness are unsubstantiated or inaccurate; and (2) the Wilderness Act provides sufficient flexibility to address the major management issues that are likely to arise in Wilderness Areas.

Twenty years ago, when we first celebrated Earth Day, the National Wilderness Preservation System totaled about 10 million acres. Today it contains over 91 million acres, a nine-fold increase in less than a generation. Moreover, the battle to designate more of our federal lands as Wilderness continues, a point that has not escaped the attention of people in Utah, Arizona, Idaho, California, and other states where major Wilderness bills are under consideration.

But we must not forget that whereas Wilderness with a capital "W" — lands that are protected by congressional decree — has grown during the past twenty years, wilderness with a small "w" — the remaining wildlands of America — has steadily shrunk. Literally millions of acres of federal lands have been mined, logged, or developed in ways that preclude their consideration for official wilderness designation. Thus, when one examines the bottom line of the balance sheet, America has far fewer wildlands today than it did in 1970. And we will undoubtedly have even less 20 years from now when we gather to celebrate Earth Day 2010.

For all practical purposes, therefore, the wildlands of America are a finite and diminishing resource. The debate revolves around how much of that resource we wish to protect for posterity and why we might wish to do so. The arguments for Wilderness designation often revolve around decidedly unecological themes, such as commodity values, recreational opportunities, and aesthetics. But I am convinced that one of the strongest arguments in support of Wilderness designation is ecological: the preservation of biological diversity. Wilderness areas are important reservoirs of biological diversity, and their value increases with every acre of unprotected land that is turned into corn, cattle, or concrete.

In recent years, a small but vocal band of state fish and game agencies, wildlife biologists, and writers has argued that Wilderness preservation is in fact harmful to wildlife or, more precisely, counterproductive to good wildlife management. Author Alston Chase, for example, has written (Chase 1989) that Wilderness protection is "[a]imed more at pleasing the recreational desires of backpackers than at the needs of wildlife."

To the contrary, I will argue that: (1) Wilderness designation is beneficial to biological diversity; (2) most of the ecological arguments against Wilderness are unsubstantiated or inaccurate; and (3) the Wilderness Act provides sufficient flexibility to address the major wildlife management issues that are likely to arise in Wilderness Areas.

WILDNESS AND WILDLIFE

Even to those who study it, ecology remains a complicated subject. The natural world is so engagingly diverse and complex that efforts to codify its workings as simple rules and formulas are usually unsuccessful. Ecological "laws" — in contrast to the laws of physics — tend to be either absurdly simple or rife with exceptions.

That said, I will mention one law that in my experience has withstood the test of time; in fact, it seems to get stronger with time. It is simply this: To find the most intact and interesting array of wildlife, go to the wilderness (that's wilderness with a small "w").

Over the past 15 years I have had the good fortune to travel to a number of countries to study wildlife in general and birds in particular. The most exciting places — those I vividly remember even now — are all essentially wilderness areas. They may not be congressionally designated Wilderness, but they are big, wild places where humans are at best a minor presence. A prime example is Manu National Park in Peru — or more precisely that portion of Manu that could only be reached by a three-day drive and a two-day canoe trip, with its harpy eagles, jaguars, tapirs, ten species of monkeys, and six species of macaws. Many of these species simply cannot be found in places where people are a dominant part of the landscape.

To find the greatest assortment of endangered honeycreepers on the island of Maui, I found myself visiting the rainforests of the Kipahulu Valley. Getting there meant a two-day hike across the floor of Haleakala Crater and over the north rim, followed by a final descent into rain-soaked forests and steep muddy slopes. In Hawaii — as in Peru and so many other places — there is a strong and obvious correlation between the remoteness of a locale, the lack of a permanent human presence, and the number of native birds.

Lest one think this pattern is solely a tropical phenomenon, consider where one might go in the United States to simultaneously find a mountain lion, gray wolf, and grizzly bear. The answer (unfortunately) is only in the Glacier-Waterton area straddling the Montana-British Columbia border. Here in a region dominated by two national parks, several Wilderness Areas, and much unprotected wildland, the three top predators of North America co-occur. A century and a half ago, these species were found throughout the American West.

Manu Park, the Kipahulu Valley, and Glacier National Park retain as complete an assemblage of native species as can be found in their respective regions. And in addition to the charismatic birds and mammals, they harbor a vast array of plants, insects, fungi and other less conspicuous but equally important life forms.

Now let us consider what the Wilderness Act means for wildlands. The goal of the act is simply to ensure that a few places retain their wild character for future generations. It prohibits logging, road and building construction, and the use of mechanical vehicles and motorized equipment within designated Wilderness Areas. Livestock grazing, where established prior to an area's designation as Wilderness, is permitted to continue. Mining is prohibited, with the exception of valid mining claims established before 1984. These may be worked at any time. Hunting is allowed in most Wilderness Areas.

The terms are stringent, but hardly inimical to wildlife. In fact, the biota of these wildlands has persisted for literally thousands of years

without extensive human manipulation of the land. The burden of proof should lie with those who would log, mine, or develop the land to demonstrate that they can do so without significantly diminishing biological diversity.

IS WILDERNESS GOOD FOR WILDLIFE?

The argument that Wilderness designation is not beneficial for wildlife is based on a belief that: (1) wildlife populations need active management, and (2) active management is not possible in Wilderness Areas. In other words, without watering devices, food plots, prescribed burns, and other tools of modern wildlife management, wildlife populations in Wilderness Areas will wither away. And unless wildlife managers have access to the back country through a network of roads, these necessary management actions cannot be performed. It reflects something of a colonialist attitude towards wildlife, a belief that nature unattended inevitably runs amuck.

There are at least three problems with this perspective. First, it is heavily oriented towards a handful of game species. The watering devices, for example, are usually cited as necessary to perpetuate healthy populations of bighorn sheep, deer, and quail. These animals represent only a tiny fraction of the hundreds, even thousands, of species of native plants and animals found in most Wilderness Areas. The other species may not be as popular with some wildlife managers, but they are an equally important part of the biota. The extent to which they will benefit from the devices is debatable. Plants, for example, may be harmed if watering devices concentrate herbivores around a small area. The devices may also draw cattle into the area, thereby reducing the amount of forage available for native wildlife.

We should not lose sight of what we hope to accomplish by designating an area as Wilderness. Wilderness Areas are intended to be remnants of wild America; they are not intended to be game farms. Section 4(c) of the Wilderness Act allows the use of motorized equipment, motor vehicles, and man-made structures when they are the minimum necessary to properly administer an area for wilderness purposes. Maintenance of existing water supplies is an accepted practice in most Wilderness Areas, and development of additional water supplies is permitted — but only when essential to wildlife survival. Land managers can construct and maintain watering devices or food plots in Wilderness Areas as compensation for natural sources that are no longer available to wildlife. But they cannot construct and maintain them to increase game populations to unnaturally high levels. These principles are spelled out in an August, 1986 agreement among the Forest Service, Bureau of Land Management, and International Association of Fish and Wildlife Agencies regarding wildlife management in Wilderness Areas.

Second, there is little evidence to even support the claim that game animals suffer when an area is designated as Wilderness. In fact, the data often tell a very different story.

For example, last summer the Arizona Game and Fish Commission expressed concern over proposed wilderness bills for Bureau of Land Management lands in Arizona. The commission was worried that Wilderness designation would hamper its ability to manage areas for desert bighorn sheep. Yet according to an analysis by the former game chief for the Arizona Game and Fish Department (Brown 1989), the annual harvest of bighorns in Arizona has increased steadily since 1965, and most of this increase has come from wilderness — designated or de facto Wilderness. Desert bighorn sheep in these areas have benefitted more from Wilderness management and efforts to eliminate feral and domestic livestock competition than from water developments. Non-wilderness areas, in contrast, have fewer bighorns now than in 1965, despite construction of numerous watering devices and the transplanting of additional bighorns.

And third, when we do not protect wildlands as Wilderness, we run the risk of opening the door to logging, mining, off-road vehicles, and other potentially destructive uses of the land. In California, for example, the Bureau of Land Management has opposed a bill to expand the number of Wilderness Areas and national parks in the California desert, arguing that it already has sufficient resources and willpower to manage the area with sensitivity to the needs of wildlife. Yet last June, the United States General Accounting Office issued a report (GAO 1989) harshly critical of the bureau's wildlife protection efforts in the California desert. The report noted that "nearly one-half of the required wildlife management implementation plans have not been developed. In addition, BLM's progress in implementing completed plans has been limited." It also stated that "BLM has frequently allowed the needs of competing interests, such as recreation and commercial use, to take precedence over wildlife interests when conflicts have arisen."

The argument that Wilderness designation is ultimately harmful to wildlife is groundless. But it raises an important issue about the future of our wildlands and the biological wealth they contain. As development engulfs more of the unprotected lands surrounding our parks and Wilderness Areas, as more species of plants and animals become dependent upon the small number of wild fragments we choose to protect, what steps will we need to take to protect them not only from ourselves, but also from some of the natural disturbances that will inevitably befall them? Small, isolated fragments of habitat are vulnerable to overuse, external influences, or even such normal events as windstorms and fires. And the small, isolated populations of plants and animals within them can be severely harmed by such things.

I was reminded of this danger when Hurricane Hugo plowed across the Caribbean and into our southeastern states last fall. In Puerto Rico, it destroyed habitat for the endangered Puerto Rican parrot and reduced parrot numbers from 47 birds before the storm to less than half that number today. In South Carolina, Hugo leveled much of the Francis Marion National Forest, which contained one of the largest colonies of the endangered red-cockaded woodpecker. Both the Puerto Rican parrot and the red-cockaded woodpecker have weathered hurricanes for millennia. But until a few decades ago, both species were far more widespread and abundant than they are today and consequently, far more likely to withstand natural disturbances.

As our wildlands become fewer and more isolated, we will undoubtedly have to increase our monitoring programs and management efforts. I am convinced that the Wilderness Act provides sufficient authority to do so. At the same time, its strict standards ensure that the biological wealth within Wilderness Areas will not be damaged by greed, indifference, or overzealous good intentions.

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DOES THE WILDERNESS DESIGNATION ACHIEVE SOCIETY'S OBJECTIVES?

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Nobody is fooled by this question. It does not take half an hour to answer yes, and leave it at that. The fact that Congress established a National Wilderness Preservation System in 1964, after 8 years of contentious debate on over 65 separate wilderness bills, hardly leaves any doubt as to "society's" objectives, goals or values with respect to wilderness. The fact that every President since Lyndon Johnson has signed specific wildernesses into being is a rather clear statement. The fact that the 1964 Wilderness Act designated 54 wildernesses encompassing 9.1 million acres with the intent to study another 34 Forest Service primitive areas and contiguous acreage, National Park and Fish and Wildlife Service units for possible inclusion into the wilderness system is not inconclusive. The fact that this wilderness system has grown from 9.1 to over 90 million acres on over 470 areas restates society's obvious objectives of wilderness. The fact that Congress added an entire agency, BLM, to the wilderness fray in 1976 isn't shaded in gray. And on a local level the fact that men such as Senator Jake Garn and Congressman James Hansen enthusiastically introduced and supported the 1984 Utah Wilderness Act is again clear indication that society's objectives are, in fact, met with the designation of wilderness.

It appears about the only direction we haven't gone or will choose to go is "no wilderness." Even that appears to be in metamorphosis as Utah's state legislature, for the first time in recent years, failed to pass a "no more wilderness" resolution, opting for a wilderness task force to consider information to assist in a formal state position. And the fact that we just enthusiastically celebrated the 25th anniversary of the Wilderness Act (in September 1989, the Utah Wilderness Association hosted a celebration on the edge of the High Uintas Wilderness cosponsored by the Wasatch-Cache National Forest and the Utah State BLM office) sends a clear signal that the Wilderness System is not yet finished.

So what is the question or how many questions, in fact, are being asked? There are the obvious questions: how much and where wilderness is to be designated; what should entail wilderness; how it should be decided upon; what resources actually benefit from wilderness designation; how to mesh local cultural values and wilderness designation; how to end the polarization surrounding the issue; how it should be managed; and how to separate it from nonwilderness issues, and still others.

There are a few things that can't be taken out of the debate. All agree it is one, only one, indication of a commitment to environmental quality. To people who place a high value on "environmental quality," something we aren't likely to universally define, wilderness is going to be of incredible importance, whether that person is a "user" or not. The opposite is obviously true.

Wilderness harbors an immense amount of symbolism and imagery. It is an icon. It seems very few enter the debate without powerful

images and perceptions. I have heard so often the charge from a county commissioner or opponent of wilderness at a public meeting of one type or another that these environmentalists are simply too "emotional" and won't listen to reason. Without even a blink we've all seen that same person simply say "no" to any wilderness and point out that wilderness is a threat to economic development, national security and somebody's rights somewhere.

But that is because wilderness is ponderable. And that alone is another value. The literature is replete with examples. It doesn't fit the scientific method, it is immensely personal and value laden, and it obviously represents the cultural heritage of this nation. Nash (1989) writes about wilderness as an "ethical constraint." Sax (1980) talks of an aesthetic or "reflective recreation." Beston (1928) speaks of the wild land and its wild inhabitants as "other nations." Stegner (1987) writes of the "the pervasive fact of western space, which acts as a preservative." Santa Fe author Dave Douglas (1987) writes of his wilderness experiences creating a "shuddering sense of dependence on God." Our own Tom Lyon (1989), Professor of English at Utah State University, at the 25th anniversary celebration of the Wilderness Act, under a crisp north wind and snow, said ". . . the world has nothing more precious, more worth saving, more worth fighting for than the song of one hermit thrush or the quick appearance and flowing disappearance of one marten . . . one of the great gifts of wild country is to restore this birthright attentiveness."

This powerful theme that wilderness is pure and rehabilitative — a very real therapy — goes far beyond simple "unconfined and primitive recreation." It seems to be trying to tie us to something. Wilderness is at the base of our dialogue with the planet on which we live. I suspect that dialogue is inescapable, crosses all cultures, and that wilderness, whether institutionalized or not, is the foundation of that discussion.

Wilderness has done more to define our land ethic and our personal, human and spiritual values toward land and its life than any other resource. Clearcuts may have permanence (unfortunately), but are of no real importance, Trees, once inhabitants of wild country, provide fiber. The West, for example, is not defined by herds of cattle or sheep, but by the wild country and its life forms prior to sheep and cattle. Wilderness gives us the opportunity to again become Leopold's (1949) "plain member." Whether we accept that role or not, it is wildland — wilderness — that has given us the opportunity to explore our relationship with the soil at our source. When we brutalize a landscape with roads and clearcuts and oil fields, when we destroy a stream and its surrounding environments, whether we need those resources or not, it is wilderness where we seem to retreat, often apologetically and just as often to see something of more importance. Our monumental effort at literally bringing Prince William Sound back to "pre-oil" can be no stronger statement of just this point. We will likely continue to be unsuccessful, but as Barry Lopez wrote in the story "Drought" in his book **River Notes** (1979) "Before we could ask for rain there had to be someone to do something completely selfless, with no hope of success. You went after that fish, and then at the end you were trying to dance. A person cannot be afraid of being foolish. For everything, every gesture, is sacred." Those words were, of course, from a blue heron.

Literally by discounting such values as frivolous or esoteric and meaningless one discounts an individual's and society's worth.

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I was hiking in the North Absaroka Wilderness a few years ago. My wife and I followed a set of astonishingly clear grizzly tracks all the way up Grinnell Creek. Fresh tracks, the night before. Why did we keep hiking through dense conifers, in and out of the stream, through low brushy country and open parklands with a grizz a day in front of us? We played the harmonica, sang, forced conversation, had the

jingling of our grizzly bells, talked to our weenie dog companion as though she could translate each crack in the timber. We spent a few days in the upper meadows, never calm but simply overwhelmed by Whirlwind Peak, the young moose that shared our stretch of the stream, the full moon and the fact that no other car had been parked at the trailhead.

Our last morning, over coffee and a sense of relief that we were leaving intact, I heard bells on the timbered slope above us. I looked at Margaret and said, "Well, at least they give us a chance here. They put bells on the grizzlies!" With that, out of the trees padded a huge, black . . . labrador and his companion, a bighorn sheep researcher from the University of Wyoming. We shared a hearty laugh, the last of the coffee, and wandered out together.

Following a grizzly in his home made me understand both selflessness and the essence of "plain member."

In a very real sense, those who say there should be no wilderness or no more wilderness are telling us that our spiritual, moral, and recreational values are without merit.

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Environmental values are at the pinnacle of this nation's domestic objectives. For the last two decades, environmental issues have dominated much of the discussion at both national and local levels. It is a complicated debate heightened by dilemmas of public versus private rights and conflicts over value systems. But poll after poll shows the protection of the environment is of critical importance to Americans.

Here in Utah, since 1986, at least three major studies have been conducted by the University of Utah, Utah State University and BYU delineating Utahns' attitudes toward wilderness and wildlife. A University of Utah study (1986) for Governor Bangerter's State Wilderness Committee clearly showed, no matter how the question was phrased, that a sizeable portion of respondents supported preservation of more wilderness in Utah than was presently designated. Pope and Jones (1987) dealt with "willingness to pay" and again showed a powerful and knowledgeable support for more wilderness than was presently designated. Krannich and Cundy (1987) studied Utahns' attitudes toward wildlife management which repeatedly revealed that wildland/natural setting was one of the key components to wildlife enjoyment, whether consumptive or nonconsumptive wildlife user. Consistently that report noted that the setting, the sense of an uncrowded natural experience, as almost or as important as the harvest or take.

Obviously some will argue with these specific studies or the dozens and dozens of polls confirming the importance of environmental preservation. But the overriding sense is a single direction toward a greater appreciation and a more vigorous defense of the environment at every level. Again, the fact that Utah's Governor Bangerter has proposed a Utah Environmental Department sends a rather indicative signal!

Clearly the preservation of wilderness adds to the breadth and depth of that environmental commitment. It enhances and preserves our diverse array of environments. Wilderness becomes the place for the fisher, wolverine, wolf, grizzly, pine marten, bighorn sheep, mountain goat and a host of other species dependent upon an environment lacking human permanence. Our commitment to the environment we profess to care about diminishes dramatically without this complete effort.

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Fege and Corrigall (1990) summarized the challenge of the enduring wilderness resource for the next twenty-five years by stating:

> As development and global environmental changes have increasingly dramatic effects, wilderness areas can stand as a yardstick for the imprint of human impact on the land and can be

reservoirs of gene pools. Over the next 100 or 1,000 years, the baseline physical and biological information for each wilderness may be invaluable as a benchmark for assessing global climate change, loss of biodiversity, and as yet unidentified environmental impacts. To achieve these wilderness values, managers and scientists must describe and monitor critical ecosystems within the wilderness system.

Again, this is hardly a new concept and has been the focus of much discussion in this symposium. Although widely believed, it is not well understood by many because of the incredible complexity of the very nature of ecosystems.

It hardly seems arguable that wilderness provides or should provide reasonably undisturbed wildlife habitat, particularly for species which have shown disdain for human meddling. It hardly seems arguable that wilderness allows or should allow reasonably natural vegetative succession to take place. It hardly seems arguable that wilderness allows or should allow predators to predate and prey to be prey. Even for the critters that are particularly adaptable to man's permanent influences, such as mule deer, wilderness provides some seclusion. It hardly seems arguable that wilderness provides or should provide clean and free-flowing water. And reasonably clean air to remind ourselves of the glorious colors (and not from space) upon this planet.

These values of wilderness have long been recognized and have come of age again as a result of a growing environmental ethic and a realization that all of the rhetoric of diversity, which many of us were taught as students in natural resource classes, isn't **just** textbook stuff.

While land managers once focused on the concept of producing edge environments at the expense of large, naturally diverse tracts of land, the concepts today are biological diversity, genetic diversity, habitat linking and land bridges. Old growth, riparian habitats, undisturbed land tracts have become the resources of concern and rightly so since they are the disappearing or vanished components. Harmon et al. (1990) noted old growth forests account for .017% of the earth's land surface. Thus the importance placed on wilderness as a critical component of this planet's land surface, largely immune from our direct ailments, is rather obvious.

Unfortunately wilderness alone will not solve these problems. Newmark (1987) showed many western National Parks, for example, are simply too small to maintain the native wildlife found there at the time of park establishment! The whole issue of how big a wild preserve must be to preserve native flora and fauna is only now being engaged and is one of the most valuable discussions encouraged by wilderness designation issues.

To focus on wilderness, with a capital "W" or not, will not be enough. We must also focus on ecosystem management across the board as well as extensive restoration and rehabilitation efforts. Both efforts represent some of the most exciting inquiries in resource management today. It is important to realize that neither addresses itself to palliative management — in other words, making a bad thing a little bit better — but, rather, to improvement and restoration of ecological integrity. Obviously timber will be harvested and sheep grazed, for example. But both should be done ecologically correctly, regardless of whether an area is devoted to wilderness (obviously one can't harvest timber in a wilderness area) or extractive use.

As a fundamental objective of our society, wilderness not only preserves important resources but provides important value-oriented opportunities. It provides an environmental benchmark and has engaged serious ecological investigations into the planet's health. It is a barometer. It allows and almost demands reflection from all of us, whether we are resource managers, resource users, or wilderness users.

Wilderness allows an experience, whether recreational, spiritual or scientific (which can certainly encompass the other two) to be focused on the "natural" environment. Unfortunately, most other forms of public wildland recreation have been oriented toward increasing visitations or making access easier for more users. Thus the facilities and services rather than the resource itself draw the user. While some may argue wilderness is of no value because one **may** be able to hear a coyote howl or elk bugle off the side of a road, it is the uniqueness of the environmental attributes harbored in wilderness that stimulates that specific wilderness experience. That wilderness experience is obviously evermore irreplaceable when the wildlife, for example, is dependent upon a wilderness setting (it has been argued that a "wilderness elk" is different than a "non-wilderness elk"). Encountering a fisher or wolverine, a wolf or grizzly bear, a boreal owl or bighorn sheep, among many others, is likely to occur with any regularity in habitats protected by wilderness.

Sachs (1990) noted that we are trained "to look at forests and see lumber, to look at rocks and see ore, to look at landscapes and see real estate." Turning everything into an efficiently run resource dictates exploitation. Wilderness forces a core change in our perceptions. A wilderness forest isn't for something else. It isn't a management obstacle. It isn't something to be penetrated with a road to produce a converted resource.

It isn't divided into two parts, development or non-development. It is moment from moment. Thunder to lightning. Powerfully warm sun to cool breeze. It is alive and useful. We don't administer it, or to it. We are part of it. It is always fresh. Contrasted with the perception that a landscape represents real estate, wilderness produces an alternate, long term view of life and living. One has to wonder whether "living" can occur only within real estate.

Remarkably enough, some have argued that wilderness use is declining in Utah and across the nation, and that is cause to oppose and restrict additional wilderness designation. This merely perpetuates the myth that wilderness serves one purpose — recreation. Yet we know wilderness is a critical component in providing stable wildlife communities, biological diversity, almost the exclusive reservoir of clean air and water, primary habitat for predators — a barometer of our humaneness and ability to survive with diverse life forms. Furthermore, the components of recreation are incredibly diverse and often verge on spiritual or re-creational values.

Wilderness offers us a chance to succeed with mother nature, not resist. To measure the value of wilderness by how many recreational visitor days occur on an acre of wilderness is obviously counterproductive to the entire concept. In wilderness space permeates.

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There are still other substantive questions that need exploration — some easier to address than those discussed so far. For example, although I'm not going to focus on it today, wilderness management is an issue warranting considerable discussion. We object to the claim that management is of lesser concern than allocation — "we can deal with management after we get it all designated." The two go hand in hand.

Unfortunately, wilderness management doesn't get much attention from land managers. Nearly six years after the Utah Wilderness Act was passed, the Forest Service still doesn't have formal maps for areas, boundaries are still being posted, and management plans, even though required by forest plans and desperately needed, haven't been initiated in some instances. Trailheads and other off-site programs, education, user registration, and informational brochures are usually neglected. On-site management is laze as well with issues such as permanent caches, predator control, and range management being approached timidly. (Yes, grazing is allowed in wilderness, but wilderness

range abuse is well documented.) Even the General Accounting Office (1989) has challenged wilderness management on National Forest lands. As a wilderness ranger I can attest, as do my peers, to many serious management problems.

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If wilderness meets all of these critical social objectives, why is it so difficult to resolve? The baggage is heavy. There is no capital T, Truth, or R, Right. Values play a significant role in the discussion. All of the elements that make the issue so ponderable, so valuable, also make it hard to resolve.

Let's look at the BLM wilderness review here in Utah. Congressman Wayne Owens, Utah's second district representative, said, "Let the debate begin." His counterpart from the first district, Representative James Hansen, responded, "Let the rumpus start." Both were talking of wilderness. Owens is the author of H.R. 1500, a 5.1 million acre wilderness recommendation proposed by the Utah Wilderness Coalition, a group consisting of the Sierra Club, Wilderness Society and many other organizations. Owens' district largely represents the metropolitan Salt Lake City area. Hansen has written H.R. 1501, a 1.4 million acre bill. Hansen's district harbors a substantive portion of the BLM proposed wildernesses. BLM has proposed 2 million acres and the Utah Wilderness Association and the state's wildlife-related organizations have long proposed about 4 million acres. For good reason, BLM wilderness triggers an inordinate amount of emotional review. The Colorado Plateau and Great Basin of Utah are physical landforms unmatched and epitomize wilderness.

But is there an alternative to yet another protracted and bloody battle over the management of public land here in Utah? What is so difficult about seeking consensus or so attractive about a no-holds barred fight? The present fight, after all, will do little or nothing to educate and alter the fundamental problems surrounding resources — that of always looking at natural resources as something to be consumed.

Both "sides" seek to coerce rather than understand. Neither side appears to have an interest in setting in motion the personal and cultural changes that must occur if wilderness is to have any value.

So long as wilderness, in this case the BLM wilderness review, is pursued as the final statement on environmental quality we guarantee islands of wilderness surrounded by masses of development. It is not hard to imagine seeing wilderness in the future as monuments to our insensitivity to larger issues rather than monuments to our vision. Wilderness is one very important issue, but not the only one. Instead of a "tool," it has become the end. For example, too often we conveniently forget that after wilderness is designated wildlife is still threatened and watersheds are still hammered by too many cattle, sheep or off-road vehicles. That is because some of the most important habitats/ecosystems don't even qualify as wilderness. Yet they deserve our attention as much as any red rock canyon or high mountain. Wilderness is a piece of the biodiversity puzzle. We must move away from the idea of wilderness versus ecosystem-damaging development as the two alternatives.

If we are to achieve fundamental change in our collective view of the land, we must recognize that it is not a matter of "us versus them." It should be obvious by now that coercing others to alter their value system doesn't work. And in the case of BLM wilderness here in Utah, for example, there is nothing magical about Congressman Owens' bill of 5.1 million acres or Congressman Hansen's bill of 1.4 million acres. The need is for pursuit of the real issues and reasonable discussion. UWA has suggested Owens and Hansen drop their respective bills and pursue the interests and values inherent to the issue. This, of course, doesn't diminish the vision or purpose of each perspective.

Lofty talk about common ground seems meaningless when opponents of wilderness, like Utah's Multiple Use Coalition, continue to denigrate wilderness. Their absurd denial must end. It lacks substance from every direction, whether biological or political.

Believing that we can or should "roll" our opponents to grab a bigger chunk of wilderness today simply creates losers and seems to denigrate all of the rhetoric about diversity and tolerance from which the environmental movement came. If we can't pursue this effort, which is far from a passive "let Congress decide for us," and solve wilderness issues with some degree of consensus, success, respect and dignity, how will we ever address global environmental crises? Wilderness offers us a chance to succeed.

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Bob Marshall, wilderness explorer, Forest Service employee and co-founder of The Wilderness Society (Glover, 1986), wrote these words in 1929, as he was exploring Alaska's Brooks Range:

> I cannot convey in words my feeling in finding this broad valley lying there, just as fresh and untrammelled as at the dawn of geological eras. . . I could liken the valley to a Yosemite without waterfalls, but with rock domes beside which world renowned Half Dome would be trivial . . . Best of all it was fresh — gloriously fresh . . . This, beyond a doubt, was an unbeaten path.

This very feeling has erupted within many a wilderness user time and time again, despite the fact that the area has been explored and re-explored. Bob Marshall may have been the first American to have a truly wilderness experience in North America. But the beauty of wilderness is that its freshness can't be terminated. And in this world what better thing to preserve?

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When I was a wilderness ranger on the Sawtooth Wilderness, and later the High Uintas, I found a "prayer" that I used each evening . . . and still do.

> "Then Bear called, Good night, Mountains, you must protect us tonight. We are strangers but we are good people. We don't mean harm to anybody. Good night, Mister Pine Tree. We are camping under you. You must protect us tonight. Good night, Mister Owl. I guess this is your home where we are camped. We are good people, we are not looking for trouble, we are just traveling. Good night, Chief Rattlesnake. Good night, everyone. Good night, Grass People, we have spread our bed right on top of you. Good night, Ground, we are lying right on your face. You must take care of us, we want to live a long time." (DeAngulo, 1953)

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DOES WILDERNESS DESIGNATION ACHIEVE SOCIETY'S OBJECTIVES? A LIVESTOCK INDUSTRY PERSPECTIVE

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In addressing this question posed to the panel today, I find that the real challenge is to define the terminology. What are "society's objectives"? How do we determine them? Does society even have a consistent and compatible set of objectives? Are those objectives rigid? Have they evolved, perhaps even changed since the original passage of the Wilderness Act?

The Wilderness Act of 1964 is the logical place to turn for the answers to these questions. Section 2 of the Act declares it to be the policy of Congress "to secure for the American people of present and future generations the benefits of an enduring resource of wilderness." The Act goes on to address "protection of these areas," and the "preservation of their wilderness character." Section 2 (c) then defines "wilderness" with considerable detail. All of this language focuses on maintaining a certain natural condition of the land unaffected by a permanent human impact. It is clearly a resource based objective.

On the other hand, the purpose statement is replete with the use of such terms as "benefit," "enjoyment" and "use." Clearly, it was not the intent of Congress to isolate these lands from use by the American people. The objective of Congress was to insure that these lands were used in a manner that did not alter their natural condition. Management of these lands was left in the hands of the multiple use land management agencies. This is further evidence of Congress' intent to mandate the condition to be preserved, not the purpose for which the wilderness lands are to be used.

Contrast this with the objectives of many segments of society today who demonstrate a special interest in wilderness. These objectives are often based on social policy and are narrowly defined to coincide with the broader objectives of a particular organization. They are laden with emotional appeal but often lacking in resource based objectivity. Society's objectives today range from prohibition of all human use in wilderness to promotion of unlimited use to be made only by a very narrowly defined segment of society.

The answers to the question posed today should lie in measuring the achievements of wilderness designation against the original objectives established by Congress — protection of the resource in a natural state for the benefit and use of this and future generations. My scorecard gives wilderness a very mixed review when so measured. The objective of preservation and protection has generally been achieved through wilderness designation. The use of wilderness has tended to be restricted to a narrowing population segment. Restraints on access are partially responsible. "Social policy" plays an increasing role in narrowing the range of acceptable uses and users. The benefits of wilderness are denied to many, most notably to those whose lives and livelihoods are tied to the areas surrounding the designated wilderness.

The challenge of the Wilderness Act is not to maximize the number of acres of designated wilderness. It is not to take lands away from the American people. The challenge is twofold: First, to selectively designate areas of land where the

resource will be allowed to evolve in a natural state not directed by the activities of man; Second, to maximize the use of the resource for human benefit in all manners that are not inconsistent with the first challenge. An area in which the first challenge cannot be met without denying all human benefit truly does not meet the criteria for wilderness designation. Clearly benefits come in many sizes and colors. Economic benefits are not per se inconsistent with the Act and economic impacts are a factor to be considered in measuring benefits.

I would like to examine closely the livestock industry's relationship with wilderness. To be properly understood, this relationship must be viewed in a historical relationship. Several perspectives are critical: Philosophical, legal, public perceptions and agency policy.

Certain specific areas of conflict surface most often in current livestock grazing in wilderness areas. These include herd management practices, people impacts on livestock, access, maintenance of preexisting improvements and predator control.

The impacts of wilderness designation go beyond the wilderness boundary. In addition to the broader socio-economic impacts on local communities, there are impacts peculiar to adjacent ranches and livestock operations. The impact from wilderness use is often much greater than that anticipated from wilderness designation. Wilderness impacts cannot be isolated. There are numerous examples of devastating impacts from the cumulative effects of a series of special use designations which include some wilderness. One of the single greatest threats to private property rights today is posed by the designation of federal reserved water rights in wilderness areas.

We are now facing the advent of a new era in wilderness designation – BLM Wilderness. The impacts on livestock management are potentially much greater here because the existing intensity of livestock management is often greater in these desert type areas. Proposed wilderness has been carved from the middle of grazing allotments leaving them looking like a sheet of paper with large illogical ink blotches. The need for vehicle access and for man made range improvements for both wildlife and livestock is greater in these deserts. The potential impact of reserved water rights could be devastating to ranches, indeed, to total local communities.

I perceive a very alarming trend away from multiple use by the multiple use land management agencies. Increasing acreages are being given special use designations. Many wilderness areas are being managed under a more restrictive philosophy that is fast approaching that of the National Park Service. This clearly goes beyond the expressed intent of Congress in the Wilderness Act.

Before concluding I feel compelled to address the perennial question: How much wilderness? Let's not spend time with the usual philosophical debate. There are two very practical questions. First, how much land can we practically manage in wilderness designation if we fully accept the challenges which I earlier outlined? Second, given that Congress has not provided a process for retrieval of these lands from wilderness designation, how much of the critical natural resource base of this country's economic wealth and productivity should we arbitrarily make permanently unavailable?

We as American people must have a long term commitment to the sound management of all of the abundant natural resources under public stewardship to achieve the greatest current and future benefit to the people of this nation. We must permit and demand that our federal land management agency personnel act first and foremost as resource managers, not as the implementers of social policy. With this as our commitment, we do not need to lock up our lands to assure that they continue to meet the broad needs of ours and future generations.

SOCIETY'S USE OF WILDERNESS AREAS

Perspective From:

Rudy Lukez
Conservation Chair of Sierra Club, Utah Chapter, Salt Lake City, Utah

PAPER NOT SUBMITTED

SOCIETY'S USE OF WILDERNESS AREAS

Perspective From:

Perry Pendley
President and Chief Legal Officer, Rocky Mountain States Legal Foundation,
Denver, Colorado

PAPER NOT SUBMITTED

MANAGING WILDERNESS – PROBLEMS, CHALLENGES, OPPORTUNITIES, AND COST

Ray Hall
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ABSTRACT: Wilderness management requires knowledge and understanding of the philosophy of wilderness. The wilderness manager's job is to manage an area that is affected primarily by the forces of nature, with the imprint of human beings being substantially unnoticable, while the world surrounding this wondrous resource continues to change at a rapid rate. In addition, the manager must educate and make others aware of the wilderness philosophy and its resource and spiritual values which make this place so special and unique. Wilderness management is not synonymous with recreation management but includes management of all resources associated with the wilderness. Many feel that once an area is designated as Wilderness the cost of doing business and management problems decrease drastically. Actually the opposite is usually true. This paper clarifies commonly misunderstood principles of wilderness management and offers guidelines for managing wilderness.

INTRODUCTION

Managing wilderness is one of the toughest and at times most rewarding assignment in the Forest Service. With one-sixth of the National Forest System designated as wilderness, management of these areas are a substantial part of the land manager's job. The Wilderness Act mandates that wilderness be protected and managed so as to preserve its natural condition. At the same time it provides for mining, grazing, water resource development, commercial services for recreation, access to private land, existing use of aircraft and motor boats, and control of fire, insects, and disease.

Wilderness means different things to different people. If you were to visualize "wilderness," the picture in your mind will most likely be different from everyone else's. There is a real spiritual value to wilderness – a place where one feels solitude, beauty, peace and freedom of nature. At the same time there are scientific, educational and historical values. It's a place your children's children can enjoy, just as you do.

The creation of wilderness has not been without controversy as the spiritual, scientific, and historical values are in conflict with economic interests. The real challenge within the Forest Service is to resolve these land use issues in a win-win situation. The wilderness advocates have to be able to empathize with those involved with natural resource-based industries. At the same time the economic interests need to recognize and try and understand the spiritual value of wilderness.

As the world continues to be developed, the value of wilderness will increase. Wilderness will become more unique as the contrast with surrounding land increases. The importance of wilderness as a place where gene pools are preserved, animals and fish live in natural habitats, and our heritage is preserved will become such that man cannot put a price tag on it. In some urban wilderness areas this is already true.

To think you can manage these unique areas and resources by leaving them alone is to be naive. With increasing man-caused pressures such as air pollution, global atmospheric changes, unnatural fires, and too many people utilizing wilderness--the cost of management increases greatly.

I will briefly cover the two main jobs of the wilderness manager: 1) Managing all of the wilderness resources and, 2) managing the users of the wilderness. Before that I would like to review the primary resource management functions that make up the wilderness management job.

WILDERNESS RESOURCE MANAGEMENT FUNCTIONS

Fire Management

Fire management is a very important and controversial issue for wilderness management, especially after the 1988 fire season. The Forest Service's overall objective is to allow lightning-caused fires to play their natural ecological role in wilderness. Challenges include protection of life and property and negative consequences to surrounding land or other resources outside of wilderness. For 50 years we have been suppressing wilderness fires too well, and the result has been an unnatural accumulation of fuels. How do you get rid of those accumulations and at the same time, avoid catastrophic fires such as those in 1988? Not easily answered. In the case of man-caused fires, the objective is to put it out as fast as possible, while limiting resource damage.

Fish, Wildlife, and Watershed Management

Fish and wildlife are but one aspect of the composite wilderness resource as is vegetation, water, or scenery. Wildlife can be the source of some of the more controversial and complex issues in wilderness management because of laws that pertain to wildlife in National Forests. Complicating the situation is the fact that the state agencies are responsible for management of the species, while the Forest Service is responsible for management of the habitat. Other areas of potential conflict are hunting and fishing, preservation of certain threatened or endangered species, funding constraints, contradictory legislation, time and space factors, interdependencies, people-wildlife conflicts, and research needs. Consider, for example, the unnatural influence made on the vegetation by the exclusion of fire. This can have a dramatic effect on habitats and the make up of wildlife species and populations. Also, geographic realities dictate that migrating wildlife such as deer and elk may spend only part of their yearly cycles in wilderness.

There are actually some wildernesses that were designated as such because of their watershed and fisheries values. Like wildlife, fish management in wilderness is controversial, especially when it involves nonindigenous species. Eastern brook trout were stocked in many high lakes in the western state wildernesses prior to designation. How are they to be managed now that the area is in the wilderness system? Artificial stocking, including the use of aircraft, was a common practice prior to designation and has been allowed to continue; but not only does the aircraft invade the solitude, the stocking itself takes away from the naturalness of the affected aquatic environment.

In the Wilderness Act there is one exception that falls in the area of watershed management. It is the allowing of water resource development (authorized by the President if he determines that such use will better serve the country's interest than would its denial).

Minerals Management

In a wilderness that has a substantial number of mining claims, mineral management is often one of the greatest challenges. While trying to preserve wilderness areas in their natural condition, the wilderness manager faces

substantial conflicts in allowing mineral development, which they have been mandated to do. The Wilderness Act of 1964 allowed prospecting and mining to occur until December 31, 1983. After that date there could be no new claims filed, but development of valid existing claims and leases with their accompanying rights, including access, could occur subject to reasonable control and regulation.

An example of the potential conflict situation is the Frank Church — River of No Return Wilderness, which contains over 2,000 mining claims. At the present time there are no large-scale mining operations in the wilderness, but there are several mining operations adjacent to the wilderness, indicating the potential for mineral deposits within the wilderness.

Range Management

The Wilderness Act allows for the grazing of livestock to continue where it was an established practice prior to the area being designated as wilderness. Congressional intent was further expressed in H.R. Report 96-617, which states, in part, "...if livestock grazing activities and facilities were established in an area at the time Congress determined that the area was suitable for wilderness and placed the specific area in the wilderness system, they should be allowed to continue."

In some instances, the impact of livestock grazing on the resources has been minimal because of the economics of grazing animals in remote areas does not make it attractive to the livestock grazing permittees. In situations where grazing does occur, conflicts are frequent. Livestock can adversely affect hiking trails, drinking water sources, and the general recreation experience. User conflicts can be a problem if visitors meet cattle along the trail or campsite. In such cases, the land manager will try to minimize the conflict by keeping the livestock separated from the users.

Recreation Management

Emphasis on customer service has increased in the Forest Service over the last several years and will continue to increase. Customers not only include those that visit the wilderness, but also the millions of people that will only see wilderness as they read National Geographic, enjoy pictures on the wall and think about their children and grandchildren visiting the wilderness someday.

Customers are telling us that their wilderness values include solitude, fishing in isolated lakes, hunting, horseback riding, rafting and knowing that the natural ecosystems are undisturbed. The challenge is to provide recreational opportunities while keeping the wilderness an area without permanent improvements or human habitation, an area where we are visitors and do not remain. Not only is our job to protect and preserve wilderness for our customers, but to provide education and awareness as to what wilderness is all about. The increasing challenge is environmental education, increasing the wilderness literacy of all people.

MANAGEMENT OF THE WILDERNESS

Managing the Resources

In the area of fire management the challenge is to restore fire to its natural levels. With the use of natural prescribed fire and planned ignitions, the objective is to reintroduce fire to the wilderness ecosystem. Managing fire is not just letting it burn, but involves a substantial amount of planning and monitoring. The decision whether or not to identify a wilderness fire as a natural prescribed fire or a wildfire is not easily made. Things that must be considered include:

- Threat to life/property
- Availability of funds and suppression resources
- Smoke management concerns
- Potential impacts on visitors, users, cooperators, communities, etc.

- Fire proximity to wilderness boundary
- Assessment of the amount of prescribed natural fire that is acceptable and manageable
- Consideration of existing and predicted weather and fuels condition
- Drought evaluation impact and/or effect
- Preliminary fire growth determination

In the case where the decision is made to suppress the fire, suppression activities must use the minimum motorized and mechanical equipment necessary and restore disturbed areas to as near natural conditions as possible.

An objective of fish and wildlife management is to diminish the degradation of wilderness quality within the constraints of overriding legislation applicable to wildlife in wilderness. It involves close coordination with the state fish and game agencies and having them understand your objectives. Where possible, we keep wildlife wild, their behavior altered as little as possible by man. A major area of concern is artificial stocking. The land manager must work with the fish agencies to discourage this stocking as it compromises the naturalness of wilderness. There is also a need to manage the hunting and fishing publics, including outfitters and guides. The objective is to permit activities that are biologically sound, legal and carried out in the spirit of a wilderness experience.

In the area of minerals management, a major concern is providing reasonable access and operation of a claim while protecting resource values. The situation is much the same when there are private land owners needing access to their land within the wilderness boundary. What is "reasonable" access? When talking about a major mining operation or a citizen needing to access his or her permanent residence you are often talking about road access -- definitely not in the spirit of wilderness management. The wilderness manager's role is to provide access and allow activities to occur while protecting the resource values.

In the area of range management, the land manager must work closely with the range permittee in developing the allotment plan and administering the permit. The manager must measure the need for activities normally prohibited in wilderness against Congressional intent and grant exceptions when necessary, keeping in mind that permitted activities may only include those that were practiced before the area was designated wilderness, and necessary to maintain the predesignation level of grazing, not increasing grazing capacities or permitted numbers.

Grazing by recreation pack and saddle stock can also damage the wilderness resources and must be managed just as intensely as domestic livestock grazing.

Managing the Users

There are two major objectives in managing the use of wilderness, controlling impacts of recreational use and providing alternatives to wilderness. Education plays a major role in achieving both objectives.

The Forest Service is presently using the Limits of Acceptable Change process in wilderness planning. This process identifies management concerns and overall management direction. Indicators are identified and used to determine the resource condition and then the indicators are monitored to determine the trend of the resource. This process puts emphasis on the conditions desired in the area rather than on how much use an area can tolerate.

One has to remember that man is a visitor and that wilderness is an area untrammeled by man. Regulation of visitor use is one of the most sensitive issues of wilderness management. Any actions proposed must be necessary to meet wilderness objectives and set forth in management plans developed with public participation and acceptance.

By providing alternatives to wilderness the Forest Service can delay and sometimes prevent further regulation of wilderness use. Freedom-based values are basic to the wilderness system so the main challenge is to provide forest visitors with the experience they seek without having to regulate or put constraints on their use.

The Costs

How does one quantify the value of wilderness, the cost of wilderness, or the opportunities foregone with and without wilderness designation? Those interested in preserving the natural, spiritual, scientific and historic character of wilderness will say that the wilderness resource is irreplaceable and cannot be subjected to human values. Economic interests will say that the value of opportunities foregone for development and utilization of available resources exceed the value of preservation, or that the cost of utilizing those congressional mandated available resources, while protecting the other wilderness values, make them economically unavailable. Both arguments are considered by Congress during the wilderness designation process and I will not attempt to address them here.

I will say that the cost of administering wilderness is going up as the man-caused pressures increase. The Administration and the Congress are putting more emphasis on wilderness and our annual budget for wilderness management is on an upward trend.

SUMMARY AND CONCLUSIONS

Wilderness management does not mean setting aside land and leaving it alone. If wilderness is to retain its enduring value, there has to be sufficient management of the resources and recreational use and administrative activities must be compatible with the wilderness character. Wilderness managers are some of the most dedicated people in the Forest Service who work under physically and politically challenging conditions with shoestring budgets. As we go from emphasis on designation of wilderness to management of wilderness, the staffing and funding will improve.

What are some of the things the Forest Service is doing to deal with the problems, challenges and opportunities related to wilderness?

Training for Agency Personnel

Establishing courses that will include wilderness history and concepts, current resource management issues, wilderness recreation management, and wilderness administration. Sessions such as the National Wilderness Conference are being cosponsored.

Professional Career Ladders

There is a need to provide appropriate career ladders for wilderness managers and recognize the special skills required to be a wilderness manager. The agency's recreation and personnel staffs are currently working on this issue.

Wilderness Education

Education is the most powerful tool for increasing public awareness about wilderness policy, affecting attitude and behavior changes, and developing an outdoor ethic. This is especially true in heavily used and urban wildernesses. We are presently developing partnerships and cooperative funding bases to teach wilderness ethics and "leave no trace" practices to our various publics. Specific projects include, but are not limited to, development of wilderness education curriculum for 5th and 6th graders, tags on outdoor clothing sold, and production of video tapes showing minimum impact camping techniques. Then there's participation in conferences like this, booths at the county fairs, interagency programs, television interviews, the list goes on!

Visitor Access to Wilderness

A study of policies on access to National Forest System Lands by persons with disabilities has just been completed. Intentions are to remove as many barriers as possible without physically altering the wilderness resource.

Wilderness Inventories

How can we know we have a problem if we do not know what the condition of the landbase was before? We are presently strengthening the application of existing Information Systems to Wilderness, including Geographic Information System and all resources reporting.

Wilderness Management Planning

Wilderness Implementation Schedules are targeted to be completed by the end of 1993. As activities and staffs for effective wilderness management are identified in each schedule, more accurate funding requests should result. As funding requests increase, hopefully the budget problems will decrease.

Setting Example for Others

What better way to deal with issues and concerns than setting an example for others? Agency personnel need to make sure we are abiding by wilderness management direction. We need to make sure we pack supplies in by pack string, that trails are cleared with crosscut saws and axes, and that we periodically review the need for administrative cabins and structures.

The Forest Service invites you to become more involved with wilderness management. Remember, we are managing the land for the people and want you to help do the best job possible. We look forward to meeting the challenge of a wilderness revolution as we head into the 1990s.

MANAGING WILDERNESS — MAKING GOOD DECISIONS

Douglas K. Morris
Sequoia and Kings Canyon National Parks, California.

It is my pleasure to share some thoughts with you about wilderness management, for good stewardship of these special places is certainly among our greatest challenges. You should recognize that I come to you as a representative of the National Park Service, which makes me--of all things — a bureaucrat. The Random House College Dictionary defines bureaucrat as "an official who works by fixed routine without exercising intelligent judgment." Obviously, I hope to change the impressions of those of you who believe everything in a dictionary.

It is true that we bureaucrats are bound by the laws of Congress, the policies of our respective Departments and Bureaus, and by countless procedures. Some of these laws serve us well, and provide significant protection to wilderness integrity. But the bureaucracy can certainly be frustrating; we share with you concerns on those occasions when some of these mandated procedures result in delay and compromise.

Please don't overlook the personal values of those of us entrusted with the responsibility to manage wilderness. We share many of the goals and emotions about wilderness that you do. We care about wilderness just as you do. Hopefully, we bring this commitment to our jobs, and find ways to successfully blend our obligations as government employees with our feelings for wilderness.

I was asked to speak with you about costs and problems associated with National Park Service wilderness management. On the surface the response is self-evident, and a list of issues can be quickly generated. Wilderness managers everywhere confront many of the same problems: We must identify and manage carrying capacity for both people and stock (horses and mules), including somehow deciding upon a maximum party size for both humans and animals; we must make decisions about campsite management — should camping be limited to designated sites, or can more freedom be provided; we must develop and administer a permit system and permit reservation program, often in concert with neighboring wilderness areas; we must establish criteria for campfires and implement closures or restrictions; we must devise comprehensive visitor education programs; we must make and enforce regulations — and through these rules find the best balance between providing freedom and assuring wilderness preservation; we must figure out how to keep wildlife wild by separating people and their food from bears and other animals; we must compare the aesthetic impacts of helicopters with the physical impacts of stock; and we must position ourselves to protect wilderness from exterior threats such as air pollution and encroaching civilization.

There is no shortage of good ideas and no limit to the strategies that address these problems. Inevitably, however, there is the need to find money to implement these ideas. Our success in securing funding can depend on many things, ranging from something as distant as the Federal budget to the priorities and values of local managers. We seldom have enough dollars, and the distribution is rarely consistent.

DECISION MAKING WILDERNESS MANAGEMENT

What I really want to address, however, is how decisions about managing wilderness are made. It is possible to find effective strategies to solve problems; in many instances there is money available. But successful application of these good ideas will always be dependent upon good decision-making. Are decisions made by people with experience and training? Are they made on the basis of objective data, or is emotion the driving factor behind a decision? Do they reflect the policies of neighboring wilderness areas? Will they serve the objectives of a broad range of interested "publics"? And, finally, will they leave the wilderness in better condition for the next set of decision-makers?

Perhaps the best way to address this concept of decision making is to describe our wilderness management program in Sequoia and Kings Canyon National Parks. It is always risky to spend too much time talking about "how we do it." But I will take the approach anyway, fully recognizing that the "we" in Sequoia and Kings Canyon National Parks comprises a variety of experienced and motivated people. For perspective, I will provide some numbers about our wilderness management program. Almost 800,000 of the 864,383 acres in these two adjoining parks are managed as wilderness, with 737,000 acres lawfully set aside as part of the Wilderness Preservation System.

In 1989 this wilderness was visited by 30,464 visitors who were issued a total of 6,970 permits; 1975 of these permits were received through advance reservation. About ten percent of these visitors traveled with stock. Six paid and two volunteer trail crews provided reconstruction and maintenance on portions of the 700 miles of trail that provide access to the backcountry. A ranger staff of 4 permanents, 26 seasonals, and 4 volunteers devotes full attention to wilderness management. The seasonal workforce includes 16 wilderness rangers, 6 trailhead personnel, range conservationist, and 3 individuals assigned to the reservation program.

This veteran staff annually performs the traditional wilderness management chores of reserving and issuing permits, educating backcountry users, law enforcement, campsite rehabilitation, and routine maintenance. However, beyond these duties, it is their long record of outstanding monitoring and documentation of backcountry conditions that is a key element of decision-making. The list of season-ending reports is comprehensive, and includes such components as inventory of campsite concerns and rehabilitation, signing needs, and trail problems. Backcountry rangers are making significant contributions to the park's computerized inventory of all wildlife, with special emphasis on rare and endangered species. For several years backcountry rangers have reported all low-flying aircraft. Additionally, on one day each month of the summer season, all aircraft seen or heard are recorded. Such detailed information and the trends it indicates provide much more credibility whenever we try to influence policy-making about military training or FAA regulations.

Perhaps the most significant recent initiative in these parks has been the development of a Stock Use and Meadow Management Plan and the employment of a trained range conservationist on the wilderness management staff. This plan, and the issue it addresses, seems to represent a model case study about decision making criteria. I will briefly describe the way that it evolved, how it works, and the dilemma that remains.

Horses and mules are a traditional means of transporting people and their supplies in wilderness throughout the west, including Sequoia and Kings Canyon National Parks. The magnitude of such use in these parks has fluctuated widely; likewise, attempts to manage stock have been piecemeal prior to the 1980s. Promoted by allegations of bias and capricious decision-making, park managers began a

comprehensive planning effort. A program was set in motion to protect the park's 200 meadows from unacceptable changes in natural species composition and soil condition due to stock use. Comparable grazed and ungrazed meadows were identified and are now sampled at 3-year intervals. Opening dates for meadows were established annually, based on when sod was dry enough to withstand hoof impact. A benchmark of 15% change in species composition, physical impact of hooves, and forest encroachment was established as the trigger point to adopt tighter restrictions, or close an area to grazing. Educational efforts emphasizing minimum impact techniques for backcountry stockusers were increased.

Concurrent with the development of the Stock Use and Meadow Management Plan, a three year research program was established to devise methods of meadow monitoring. With that research now complete, the parks have established the range conservationist position to apply and continue to revise the recommended procedures. We are now in the process of accumulating information about the park's meadows and what changes in species and distribution are attributable to horses and mules. The obvious value of this information is the opportunity to make defensible decisions that are based on objective data.

The inevitable shortcoming of this program, however, is that it doesn't provide a way of blending the scientific procedures of range management with the strong emotions of wilderness users. Angry visitors write letters, or tell us personally, about how a visit to a pristine lake basin was spoiled by the presence of manure and hoofprints. While research has determined that these remains disappear without unacceptable harm to the resource, visitor comment indicates that in certain locations hoofprints and manure are an unacceptable intrusion in wilderness. Sociological research into the wants and expectation of backcountry users is needed; the results may contradict the findings of the most accurate range conservation techniques. Decision-making, then, becomes more complicated, and less certain.

Good decision-making also considers our neighbors. We all know that wilderness management is often regional, both geographically and in terms of visitor use. In the Central and Southern Sierra wilderness has been established in six national forests and three national parks; many adjoin along the crest of the mountain range. Understandably, the visitor is quickly frustrated when crossing political boundaries only to confront a new set of regulations and permit procedures. Differences in group size, fire restrictions, permit procedures, and even pet restrictions can certainly appear arbitrary when applied in a common environment.

To address these concerns in our part of the Sierra a work group of chief rangers and forest recreation officers has been established to improve coordination. We meet at least quarterly for the sole purpose of improving the quality and consistency of our wilderness management efforts. Our purpose is development of joint recommendations for decision by our respective superintendents and forest supervisors, who meet once each year. This ongoing liaison has proven very useful and has resulted in several achievements, including a joint training curriculum, a shared permit system, and progress in developing consistency in such issues as maximum group size, fire restrictions, and stock limitations.

Independent of this work group is a 15-year tradition that each fall brings together many field and supervisory level wilderness management people from the Central and Southern Sierra. This meeting now involves about 75 participants each year, with the agenda planned as a combination of training and communication.

My final concern about good wilderness management decision-making involves a component that can be the most difficult of all--a manager's intuition and personal judgment. My

remarks thus far have focused on objectivity, and the absolute necessity of assembling a comprehensive set of facts to guide and defend decisions about wilderness. The Wilderness Act, the various legal authorities for each bureau and each wilderness area, a multitude of regulations and procedures, all document our attempts to represent wilderness in an objective fashion. A philosophical concept is reduced to words.

CONCLUSION

But for all of us wilderness is, perhaps above all else, an emotional thing. We each have a vision, and feeling, about what wilderness is, and what our experience in it should be. Our visitors do too, and such feelings are often held very strongly.

They influence expectations of wilderness managers, and raise important questions. How does our decision-making reflect the emotions generated by wilderness? At what point does the search for data from scientists and sociologists end, and personal judgment enter the process? Are public aspirations better served when managers reach to criteria beyond the purely objective for their decisions? To what degree should we do so? Will such decisions result in praise or condemnation?

I believe these kinds of questions invite the most difficult decisions. They take us beyond what is objective and measurable and into personal values and institution. Decisions based on the latter are invariably more difficult to defend, even when the result is increased wilderness preservation. Nevertheless, managers should carefully consider such questions for their situation whenever decisions are made. Our wilderness areas will be better for it.

I want to close on an optimistic note. From my corner of the country it is apparent that management of wilderness on lands of the National Parks, the U.S. Forests, and the Bureau of Land Management is improving each year. Our communication and coordination are steadily getting better. The National Park Service has designated wilderness coordinators in our central offices, including Washington, D.C. A course entitled Wilderness Management for Managers is being presented this week in the NPS Training Center for Grand Canyon, Arizona. An effort is underway to produce a National Guideline for wilderness management throughout the National Park System. A number of controversial policies will be addressed in this Guideline, with answers applicable throughout the country.

Our challenge in the future is to improve upon these initiatives and to develop better ones. I am fully confident that our dedication and ingenuity will foster this attention. More than anything, however, we must make good decisions. This is the one factor most crucial to successful wilderness management.

THE CONCEPT OF WILDERNESS, AND ITS CHALLENGE TO SAVAGE CAPITALISM: Redefining the Dictum of Henry David Thoreau

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INTRODUCTION

"In wildness is the preservation of the world." Probably no other bon mot is quoted more often at conferences such as this one. The observation made by Henry David Thoreau a century ago maintains its appeal and mystique to this day. It serves us presently as the title Mike Frome chose for his thoughtful, and thought-provoking, paper.

Mike's paper does two other things that are unique, I believe, among the collection of presentations we've heard: he recognizes and asserts the inseparability of man and nature, and he deplores the increasingly inequitable distribution of wealth and well being among the world's people. **Wilderness is not an unrelated issue; and by that I do not mean we need to invade wilderness to provide jobs and economic development.**

No, I mean instead we need to consider carefully the man/nature relationship as we talk about wilderness, and we also need to be concerned with the well being of people and how wilderness can affect that. I have prepared the remarks to follow attempting to do both, but I relied on Mike's paper for inspiration and incentive. I hope you don't see us both simply as a couple of old-line liberals approaching incipient middle age.

OVERVIEW

I've been asked to provide a "political perspective" in summarizing the papers of this conference. To do so, I will define politics broadly: politics is the set of institutions for the construction of enforceable rules, by which a society can sanction or prohibit any human action.

Consider: we have prohibited anyone, in either individual or corporate incarnations, from logging, mining, or otherwise "developing" some 91 million acres of the U.S. Landscape, and we did it through politics. We call these acres "wilderness."

The **concept** of wilderness, it seems to me, embodies a number of interrelated ideas: an appreciation for "natural" systems — what I will call later in this paper "spontaneity"; the respect for the complexities — and the other, non-human citizens — of spontaneous systems; more than a bit of wonder and humility; and the capacity for and exercise of self-restraint to create and maintain the integrity of wilderness.

But the wilderness concept also embraces a great anomaly, I believe: we have yet to sort out unequivocally, or to agree upon consensually, the relationship of man to nature. Mike Frome sees no separation, and I don't think I do, either; I'll try to address this issue later.

"Savage capitalism" is a term I ran across in Andre Carothers' editorial in the current issue of **Greenpeace** magazine. At its simplest, it is capitalism pursued with a single-valued objective: maximum net revenue, with little if any regard for either social or environmental consequences. With a few exceptions, perhaps (IBM tries not to lay off its workers), I believe the term accurately characterizes much of the economic system in the United States today. (Carothers makes a persuasive case that it characterizes much of the industrialized world; but I will restrict my remarks largely to the circumstances and conditions in the U.S.)

I believe Savage Capitalism has driven the American consumer to a state of hyper-consumption. There are important and tragic exceptions, but most of us would be better off physically, and I suspect emotionally and even spiritually, if we consumed less. An economist would say we are consuming in the range of negative marginal returns. You might also say we are consuming great quantities of "hypergoods:" those which are not only surplus to our real well being, but arguably detract from it.

Why would any rational person continue on this course? I believe most of us live in a state of "Consumer Euphoria," in which we have been literally hyped into behaving that way. We are persuaded to participate, and we do, in a system of high-pressure, high-velocity, straightline production, consumption, and disposal – from the mines and forests of our country, through the polluting mills and factories, directly to the landfills, with consumer goods residing in the utility stream sometimes only for a matter of hours. Consider paper and plastic grocery sacks, for example.

The **concept** of wilderness, the notion of precluding **consciously** the production/consumption/disposal chain from land to landfill, might well be a potent weapon to level against Savage Capitalism. The cellulose-production of 91 million acres that we know of, for example, will never clog any landfills, nor appear in our mailboxes as our daily ration of redundant catalogs. (Persuading us to buy, beyond doubt, another increment of hypergoods.)

Later in this paper I will make the case for classifying more acres of our public lands as Wilderness. I will not rely on aesthetic reasons, nor spiritual reasons, nor biological reasons, nor other such orthodoxy. We need consciously and deliberately to pre-empt commodity resources in Wilderness, I believe, so they cannot be used otherwise in the production of hypergoods.

That may be a dramatic, perhaps a radical suggestion. It is also dangerous. It is neither unerringly effective, nor demonstrably and reliably just: corporate producers have alternate sources of raw materials — many in third-world countries — and wilderness-pre-emption may well be a futile exercise in suboptimization, with counterproductive results. It is a tactic to be used with extreme caution, and the judicious anticipation of second-order consequences.

So I will offer a far less dramatic, far more conservative, and ultimately, profoundly, far more effective complementary weapon in the struggle against Savage Capitalism. To maintain a degree of suspense, and to insure a modicum of attentive listening, I will postpone suggesting it until later.

ECONOMICS, POLITICS, AND THE STATUS OF THE BIOPHYSICAL ENVIRONMENT

I feel compelled, in my undergraduate teaching, to describe the contours and dynamics of the economic and political institutions in which my students, neophytic professional foresters, will be immersed, and the consequent effects on the biophysical environment. I rely on a number of heroic generalizations to do so.

Perhaps my students are inexperienced in intellectual debate. Perhaps they are conditioned to accept their teachers as indisputable. Perhaps

they see very quickly and clearly the genius of my characterizations. In any case, they rarely complain and virtually never disagree.

Particularly regarding undergraduate students, one equates silence with consent at considerable peril, of course. But let me try my generalizations on you.

The market — and marketing — institutions of American capitalism encourage in society at large, and in each of us as individuals, materialism, consumption, hedonism, narcissism, and impatience — the elements of Consumer Euphoria. Given single-valued objectives on the part of producers, Savage Capitalism drives us to the hyper-consumption of hypergoods. I believe we have become a nation of Consumption Junkies, with consequent, direct, and massive environmental and social impacts.

Consider the fast-food hamburger. Journalist Tom Knepher assembled the following story, and published it last November 9 in a Sedona, Arizona, newspaper.

To put a "Quarter-Pounder" in front of you, four pounds of grain and soybeans have been fed to a cow. By the time you get the result, 90% of the protein, 99% of the carbohydrates, and 100% of the dietary fiber in the grain has disappeared--into the cow, as it awaits slaughter and conversion into fat-laced hamburger. Thousands of people around the world starve each day, while here in the U.S. we feed to livestock 80% of the domestically-grown corn and 95% of the oats.

Not all the beef is grown in the U.S. In Central and South America, 5,200 square miles of tropical rainforest are burned each year to produce the 200 million pounds of beef we import, mostly for the fast food industry.

More than two-thirds of the rainforest in Costa Rica have been converted to pastureland. This comprises over half the agricultural land in that country. It is owned by less than 2,000 individuals and corporations.

Back home again, more than half the water consumed in the U.S. each year is devoted to livestock production. If you'd like to know the extent of the water-development subsidies provided to Western agriculture, read Marc Reisner's alarming book, Cadillac Desert. Some growers pay as little as $3.50 per acre-foot, and at that rate there is virtually no incentive to use water carefully. That quarter-pounder accounts for 625 gallons.

Clearly, the input-side to the fast food industry imposes stupefying impacts on the biophysical environment. So does the output side. The McDonalds chain produces enough plastic-foam trash, manufactured with CFC's, to fill both World Trade Towers in New York. Every day.

Last week, our stockbroker sent a flyer, imploring my wife and me to invest in McDonalds. The growth rate of that company has been phenomenal. In 1989 it opened a new restaurant every 16 hours. In 1990 it will open a new one every 15. Its first in Moscow was headline news.

The social consequences of the fast food industry are as severe as the environmental effects. Most employees receive minimum wage, and few are allowed a full 40-hour workweek--and so receive no fringe benefits. Women and minorities rarely are awarded franchises, particularly beyond the limits of minority-dominated communities. Typically about three-quarters of the expenditures of a given restaurant are made outside the community in which it is located, but locally-owned restaurants are displaced.

Do you deserve a break today? Does that message, hammered at us dozens of times a day, encourage materialism, consumption, hedonism, narcissism, and impatience?

Clearly, Big Mac's make no sense, in any terms of environmental, social, or individual well-being. They make enormously good sense,

in terms of immediate and hugely positive cash flow for the McDonalds Corporation. That is Savage Capitalism, I submit; but please notice a critical proviso. Savage Capitalism at McDonalds depends on the willingness, of millions of people each day, to buy a meal at the double arches. I'll have more to say about that later.

For now, let's look at the political system, and the heroic generalizations my students suffer in that regard. American political institutions, I tell them, accommodate the expression of spiritualism, not materialism; of preservation and restraint, not consumption; of moderation, not hedonism; of humility, not narcissism; and of patience. Political institutions make possible the Social Transcendence of Consumer Euphoria, and we have some fine examples.

The Wilderness Act of 1964 is just one, and it illustrates my final generality: the state of the physical environment is determined by the tension between the economic and political systems.

Left alone, and relying for its vitality on our willingness to consume and our capacity for Euphoria, the market system would put into the production/consumption/disposal stream the resources of the entire American landscape.

But our collective spiritualism intervened, and overrode our individual materialism. As Mike Frome said, the Wilderness Act serves "...as a symbol of hope and reason, of respect for the earth as the source of respect for each other." Our collective capacity for preservation and restraint overrode our individual propensity to consume, and on 91 million acres we have precluded the mining and harvesting of commodity resources — the raw materials for hypergoods. The Social Transcendence of Consumer Euphoria has been accomplished, at least on those wilderness acres.

Almost. Livestock grazing continues in designated wilderness, as provided by the law, on lands administered by the U.S. Forest Service and the Bureau of Land Management. I believe it is time to amend the Wilderness Act to prohibit it. We need deliberately to preclude, I think, the production of red meat — arguably a conspicuous hypergood — on those lands. The second-order consequences are manageable under any one of a dozen alternative policies to compensate the current permit holders. But using the Gila Wilderness, or the High Uintas, or the Selway-Bitterroot to provide ourselves with Big Macs is a travesty.

THE MAN/NATURE ANOMALY IN THE WILDERNESS CONCEPT

A dichotomy between man and nature, I believe, is evident, in one of a number of ways, in most the papers we've heard. Some assume the dichotomy, and take it essentially as given; some make judgments about it, and do not favor the human component; at least one author — Mike Frome — denies it; others — Mr. Hall and Mr. Morris, speaking for the management agencies — largely ignore the dichotomy in discussing the problems of wilderness management; and Tom Bonnicksen deplores it. It may be well to seek some agreement on this issue, but I am not altogether sanguine about achieving much.

Professor McCool's essay staked out the no-compromise, almost absolutist territory, I believe. Wilderness is the domain of ecology, i.e., "nature," working uninterrupted by human machinations or artifacts. Thus Professor McCool is comfortable in suggesting the prohibition of hunting and fishing in wilderness: it is simply a human intervention in natural, "ecological" processes.

I am troubled by this ecological orthodoxy. Most biological science begins with someone looking out the window, so to speak, to see what is going on. Observation of "reality" is the point of departure; hypotheses are constructed to explain the observed phenomena, and experiments are conducted to test the hypotheses. Eventually "theories" appear in textbooks, as

evolving explanations of reality, presumably with increasing reliability.

Orthodox ecology seems to have begun, however, not with an observation of "reality" but with the reading of a pre-existing textbook. Surely the first ecologists, had they initially looked out a window, would have observed human beings busily at work in various landscapes, sometimes benevolently, sometimes otherwise.

The theories we find in contemporary ecology texts, however, ignore systematically this very conspicuous component. They explain what will happen, on various subsets of the planetary surface, if and only if one species, Homo sapiens, is utterly absent.

I find this a notable oversight. Explaining the behavior of systems in the remarkably unreal absence of the single most influential species may provide an interesting datum, but the exclusion is clearly arbitrary. Why not exclude sperm whales? Or some species of nematode? Including "the contriving mind and the cunning hand of man" in ecological theory certainly complicates the field of inquiry, but its systematic exclusion is difficult to explain, much less to defend.

Professor McCool's paper wisely makes no normative judgments, but in his perception of wilderness, man has to be absent.

I believe man must be absent from Professor Romme's wilderness, too. His ecology varies from Professor McCool's in ways I was unable to distinguish. The dichotomy is clear and complete; Professor Romme's "natural" realm does not and cannot accommodate the actions and artifacts of man.

I found Mr. Wilcoves's paper appealing. It was an intelligent, articulate rebuttal of the game management paradigm, a wildlife counterpart to the entreaty of the quintessential timber beast. A sustained yield of meat, Mr. Wilcove argues, is no more to be appreciated, ipso facto, than a sustained yield of sawlogs. The entire system, not any single product, is the important focal point of concern. Wilderness areas are not meant to be game farms, and they are not meant to be timber plantations. Agreed. But Mr. Wilcove's wilderness, and Mr. Wilcove's "nature," it seems to me, cannot accommodate the influence of man. The dichotomy is undiminished.

Professor Knight's paper struck me as excellent, but normal, science. In documenting the impacts of recreation use on biodiversity, he has given us some solid information at the margin; the datum is separate and independent "nature" once again, but we can understand the consequences of human activity in a "controlled experiment," accordingly. The dichotomy is once again assumed, taken as given; I trust it originates in Professor Knight's orthodox ecology.

Professor Knight's paper, however, displays a common feature of the man/nature dichotomy I find especially troubling. He makes a normative, and pejorative, comment about the human component. "All of these effects of recreational use on biodiversity can be considered detrimental because they represent deviations from natural conditions."

The adoration of "nature" and the denigration of man is a familiar theme. It may have sprung from Alexander Pope describing a natural landscape "...where every prospect pleases, and only man is vile." In any event, I believe ecology — and science in general — should stop where normative judgments begin.

Now should we talk about theology? It is indeed easy to adore nature and deprecate man. Much in our culture, our literature, and our history can lead us to do so. Certainly the intellectual division of man expressly from the rest of nature sets the stage for comparisons and for judgments to be made. Nature-worship becomes, in today's lingo, a piece of cake, and "theological management" a distinct possibility.

I agree with Tom Bonnicksen we should be very careful about doing this in the management of national parks in general, and wilderness areas in particular, because I do not think "man" and "nature" are separate at all.

WILDERNESS IS NATURAL; SO IS A SHOPPING MALL

I would rather distinguish human actions, decision-determined actions, from biophysically spontaneous actions, and consider them both "natural." It follows, I believe, that human intervention in spontaneous actions is neither good nor bad in principle.

Knowing what will happen in a biophysical system if we don't do anything is interesting and valuable. Wilderness can provide this datum. We may prefer the spontaneous outcome, instead of the results of human intervention.

We have about 10,000 years of history, however — since the invention of tools — that argues to the contrary. There are, apparently, some isolated cultures that still depend on the spontaneous behavior of their environment: most of mankind opted for intervention long ago. I don't think anyone needs to apologize — the cultures who intervene or those who don't.

Wilderness is described in law today as a place where "man is a visitor who does not remain." We choose not to live there. That description also applies to churches, museums, theaters, libraries, and shopping malls. I consider them all "natural." The difference has something to do with spontaneous actions and the presence or absence of interventions.

I believe the entire surface of the globe has been, and continues to be influenced by human decisions. We decide to intervene in spontaneous processes — or we decide not to. The status of every square foot of the Earth's surface is determined by human decisions AND the spontaneous processes operating there. Downtown Los Angeles. The "Inaccessible Area" of Antarctica — in which we recently chose to intervene. Iowa cornfields. The John Muir Wilderness.

There is just one "biosocial system," I believe, (the term is Tom Bonnicksen's). "Wilderness" exists not only because it displays biophysical spontaneity, but also because we have chosen not to intervene.

I believe we have to think about and manage wilderness accordingly.

REDEFINING THOREAU'S DICTUM, AND CONFRONTING SAVAGE CAPITALISM

Will the preservation of the world be found in wildness? Will mankind ultimately survive there? We don't know, at least I don't know, what Thoreau really meant, but maybe it was something close to wilderness as we know it today.

If so, Mr. Thoreau can rest easily at peace. Our technology for surviving in the wilderness is as sophisticated as any we have. Outside magazine hawks it every month: exotic tents, space-age plastic boots, synthetic insulation in parkas and sleeping bags, and an exquisite, gourmet cuisine that stops just short of freeze-dried caviar. Hypergoods all, I believe. Hyper-consumption is alive and well in the back country. Savage Capitalism is at work there, too.

There are other measures. A box of Wheaties today costs 84% more than it did in 1981. The price of the wheat in the box has declined by 33% in that much time. In 1976, the richest 1% of American people owned 19.2% of the nation's wealth. By 1988 they owned 36%. Mike Frome's allegations are borne out in facts.

Is Thoreau's dictum the solution? It could be, if we redefined "wildness" or "wilderness" as a biosocial concept, a blend of spontaneous

processes and human decisions not to intervene. That way, we are not limited to classifying only the lands "where the hand of man has never touched foot." "Reconstituted wilderness" is not only possible, but palatable — and we have the Eastern Wilderness Act as a striking example. We can have as much of that sort of wilderness as we want. I believe, to short-circuit the prospect of hyper-consumption, we should have a lot more.

Collectively, working through political institutions, we can constrain the raw material supply for the production of hypergoods, through the pre-emption of commodity resources. That does indeed demonstrate collective restraint, but Savage Capitalism is well represented in the political arena — witness the Reagan years — and initiatives there will always be contested. Commodity-resource pre-emption is always difficult, then, and please remember my caveat earlier about second-order consequences.

The potency of the wilderness challenge lies only partially in the political arena and in collective action. When we adopt as individuals the wisdom of the wilderness concept — the respect for spontaneous processes and for other creatures, and in particular the restraint this calls for — another and far more potent weapon emerges.

We can, I think we must constrain the demand for hypergoods.

That is a far more effective weapon in the conflict with Savage Capitalism. To indulge a contemporary cliche, just say no to the consumption of goods that detract materially from the quality of your life. Start with a Big Mac. (Most of us really do need, and want, to lose a few pounds; we'd be better off if we ate less. That's the circumstance of hyper-consumption.)

It won't be easy.

Americans, it has been noted, go to the market place not merely to buy. We go to find out what it is we want, and then buy. This is the Euphoric Consumer acquiring hypergoods, and the behavior, I believe, has been carefully conditioned and nurtured.

"Free" markets, of course, are not free. They are driven by corporate policies on products, quantities, and prices, and dominated by persuasion — from the most imaginative, creative minds in our society, whose ingenious and beguiling advertisements hammer us all day long, from billboards, television, newspapers, magazines, radio, movie screens, and Lord knows our personal mailboxes and telephones. The messages are continuous, seductive, and effective: they are the source of hyper-consumption in our society, I believe.

Still, we have to be willing to buy hypergoods. The responsibility ultimately is ours.

If we take the time to learn where hypergoods come from — Big Macs from devastated tropical rain forests or the grass in the Gila Wilderness; if we consider the social consequences — gross inequities in the concentration of wealth; if we realize how much better we could live if we consumed less — the inescapable up side of hyper-consumption; Savage Capitalism is rendered powerless.

Wilderness — as landscape and idea — has a lot to offer.

Consider this: Americans consume about 50 million tons of paper each year. Ask yourself how much of that comes to your house in the form of grocery sacks, redundant packaging, and unwanted mail. Could you cut your pro-rata share in half? If everyone did, roughly two million acres of timberland could be classified as wilderness instead. That's about the size of Yellowstone National Park.

SPEAKER BIOGRAPHIES

WILDERNESS AREAS: THEIR IMPACT
A Symposium

BEHAN, Richard W., is currently Professor of Forest Policy at Northern Arizona University School of Forestry. Dr. Behan received his B.S. and M.S. from the University of Montana. He attended the University of California, Berkeley, in the School of Forestry to complete his Ph.D. Dr. Behan's interests and studies have focused on wilderness decisions and policy making; the politics of natural resource management; history and development of popular and professional ideas of resource conservation and management; application of management sciences to natural resource management; applications of simulation modelling with EZ-IMPACT to activities of decision-making and conflict-resolution.

BONNICKSEN, Thomas M., is Director, Office for Strategic Studies in Resource Policy, and past Head of the Department of Recreation and Parks at Texas A&M University. Dr. Bonnicksen earned his B.S. in Forestry, Wildlife and Range Management, M.S. in Forest Ecology, and Ph.D. in Resource Policy and Public Administration from the University of California-Berkeley. Dr. Bonnicksen's research has focused on forest policy and management criteria for wilderness and parks. He has served on numerous national and state advisory councils and committees dealing with wilderness and park development, from the Pacific Crest National Scenic Trail Advisory Council to the U.S. Forest Service Wilderness Permit Advisory Committee. He is currently an elected member of the Board of Directors of the Society for Restoration Ecology.

CARTER, Richard (Dick), is the founder and coordinator of Utah Wilderness Association, a nonprofit conservation organization based in Salt Lake City, Utah. A 1973 graduate of Utah State University, Dick has a B.S. in Forest Science. An avid hiker, Dick worked six seasons as a wilderness ranger for the U.S. Forest Service in Utah and Idaho. In 1975 he became a Natural Resource Specialist with The Wilderness Society in Washington, D.C., then headed their Utah Regional Office, where he helped direct enactment of Utah's first wilderness area, Lone Peak, and the first emergency mineral withdrawal under the Federal Land Policy and Management Act on the Deep Creek Mountains. Since 1979, Carter and the Utah Wilderness Association have spear-headed many public land campaigns in Utah including issues as diverse as predator control, logging, and energy development. In 1984 Carter and UWA played perhaps their most critical role in conflict resolution -- the passage of the Utah Wilderness Act.

FROME, Michael, has enjoyed a colorful and creative career as writer, activist and educator, which he continues to pursue. As Environmental Journalist-in-Residence at Huxley College of Environmental Studies, a division of Western Washington University (Bellingham, Washington), he is pioneering a program in environmental journalism and writing. He has been called "the voice of the wilderness" and "the conscience of the national parks." Senator Gaylord Nelson of Wisconsin declared in Congress: "No writer in America has more persistently and effectively argued for the need of national ethics of environmental stewardship than Michael Frome." In 1971 Tom Bell in **High Country News** wrote about Michael Frome: "The depth and clarity of his writings have served to alert the public to many of our most glaring environmental problems."

HALL, Randall R. (Ray), is currently Director of Range and Watershed Management for the Intermountain Region of the Forest Service. The Intermountain Region contains 32 million acres

of National Forest System lands, located in Utah, Nevada, Southern Idaho and Western Wyoming. He graduated from the University of Missouri in 1960, with a B.S. in Forest Land Management. During his 30 years with the Forest Service he has held positions of District Ranger, Job Corps Center Director, Forest Supervisor, and Range Management Staff Officer; with assignments in Colorado, Wyoming, Oregon, and Washington, D.C., prior to coming to Utah in 1985.

KNIGHT, Richard L., is presently an Associate Professor of Wildlife Ecology at Colorado State University. He received his Ph.D. at the University of Wisconsin where he studied with Stanley Temple. Following this he did postdoctoral work with Gordon Orians at the University of Washington. His research interests focus on the effects of human perturbations on terrestrial vertebrates. David N. Cole is Project Leader of the Wilderness Management Research Unit at the Intermountain Forest and Range Experiment Station (USFS) located in Missoula, Montana. He received his Ph.D. from the University of Oregon and is interested in effective management of wilderness areas with emphasis on minimizing recreational impacts. With W. E. Hammitt, he is author of **Wildland Recreation**.

LUKEZ, Rudy, is the Conservation Chair for the Sierra Club's Utah Chapter. This position involves directing and organizing the Sierra Club's role in promoting the 5.1 million acre BLM wilderness proposal of the Utah Wilderness Coalition and Congressman Wayne Owens. The Sierra Club is also involved in identifying new wilderness proposals for Utah Forest Service and National Park Service lands. Mr. Lukez is also a representative to the Club's Southwest Regional Conservation Committee and the principal organizer of the Utah Wilderness Coalition. During the past six years he has traveled extensively to current and proposed wilderness areas in the Southwest. Mr. Lukez earned his B.S. in Mechanical Engineering from Cleveland State University. Today, he is employed as a structural aerospace engineer with a Salt Lake based composite materials manufacturing firm.

MAGAGNA, Jim, is president of the Public Lands Council, representing livestock permittees and lessees on federal lands. He earned his BBA, Business Administration, in 1965 from the University of Notre Dame and his J.D. Law, from Stanford University in 1968. Mr. Magagna is currently president and manager of Magagna Bros., Inc., a third generation range sheep operation. He is also vice president of the American Sheep Industry Association and is past president of the Wyoming Public Lands Council and Wyoming Wool Growers Association. Mr. Magagna is a member of the Board of Directors of First Security Bank of Rock Springs and past president of the Board of Trustees for Western Wyoming Community College. He is a life long resident of Rock Springs, Wyoming.

McCOOL, Steven F., is currently Director of the Institute for Tourism and Recreation Research, and Professor, Wildland Recreation Management at the School of Forestry, University of Montana. Dr. McCool earned his B.S. degree in Forest Resources Management from the University of Idaho. He received his Ph.D. in outdoor recreation management from the University of Minnesota. Dr. McCool has worked extensively with communities and institutions in Wisconsin, Utah, and Montana in improving the recreation and tourism opportunities. He has also conducted research on the social carrying capacity concept and use of information as a tool for wilderness management. Additionally, Dr. McCool led the effort to develop a new management plan for the Bob Marshall Wilderness Complex.

MORRIS, Douglas, is the Chief Ranger on the Sequoia National Park. He is responsible for developing the new management plan for the Sequoia and Kings National Parks. He has also been an instructor at the Albright Training Center for the National Parks. In this capacity he helped train many park service personnel on the various management strategies used in the National Park wilderness areas. He has also had experience as Chief Ranger at the Cape Cod National Park and as District Ranger in the Sequoia National Park.

PENDLEY, Perry, is currently President and Chief Legal Officer of the Mountain States Legal Foundation, a nonprofit, public interest legal center dedicated to individual liberty, the right to own and use property, limited government, and the free enterprise system. He received his B.A.

and M.A. in political science and economics from the George Washington University in Washington, D.C. He received his J.D. Law from the University of Wyoming where he was a Senior Editor and an author of the Land and Water Law Review. Mr. Pendley has held numerous governmental positions including the attorney to former U. S. Senator C. P. Hansen and Secretary of the Navy J. F. Leham, Jr. He also served as the Acting Assistant Secretary for Energy and Minerals as well as first Director of the Minerals Management Service at the U.S.D.I.

ROMME, William H., is an associate professor in the Biology Department at Fort Lewis College in Durango, Colorado, and currently is a visiting scientist with the Environmental Sciences Division of Oak Ridge National Laboratory, in Oak Ridge, TN. Prior to this position Mr. Romme was an Assistant Professor in the Natural Science Department at Eastern Kentucky University in Richmond Kentucky. He is currently a member of the Science Council for the Greater Yellowstone Coalition and has done research on the "Fire and landscape dynamics in Yellowstone National Park." Dr. Romme earned his B.A. in Chemistry from the University of New Mexico, his M.S. and Ph.D. in Botany from the University of Wyoming. He is known for his research and publications on issues relating to Yellowstone National Park.

WILCOVE, David, is a senior ecologist with the Wilderness Society in Washington, D.C. Prior to joining The Wilderness Society, he was a research scientist in zoology at the national office of The Nature Conservancy. He received B.S. degree from Yale University in 1980 and a doctorate in biology from Princeton University in 1985. Dr. Wilcove has written numerous scientific publications and popular articles on the conservation of biological diversity. He serves on the board of directors of the U.S. and Pan-American chapters of the International Council for Bird Preservation and is a member of the editorial board of the Journal **Conservation Biology.**